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TW7100
Wireless Intercom System

TW7100D11
User Manual
V1.6 / May **200**9

Calidad Registrada ISO 9001 ACCM

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KROMA TELECOM

FOREWORD

Before proceeding with installation, check safe arrival of equipments with all required accessories. If not, kindly ask Kroma or your supplier.

This manual includes all parts of TW7100 system.

It is divided into:

- **MANUAL FOR INSTALLERS**

  Connectors, pin outs are described thoroughly.

- **MANUAL FOR USERS**

  How to operate the system? What can be done?

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0 REVISIONS

Control of Modifications

Version	Date	Involved Parts	Comments
1.6	05/2009	4.2	- Changes in terms of guarantee
1.5	12/2007	Schematics 3.1 Base	- New PCB in base TW7100P03-03 - New function ‘Narrow band’
1.0	02/2007	-	- First Version of Manual

1 FEATURES

1.1 INTRODUCTION

Wireless intercom system TW7100 is based on 'WiFi' technology, compatible with 'TCP/IP' systems which allow the use of 'IP' networks. It consists of a fixed base station and up to four wireless beltpacks that communicate among themselves and with other external systems.

Base station is provided with four IP links that allows a data-and-audio communication of up to four wireless beltpacks maximum per base station.

This system can work standalone (beltpacks intercommunicate within themselves) or integrated with other external talkback systems, analogue or digital.

The channel established between beltpack and base station is 'full-duplex', which allows simultaneous conversations in both ways. Also, user can encrypt IP data packages securing the conversation.

Coverage area is defined by location and range of point of access. Wherever beltpacks will be operating, a point of access will be placed.

Points of access with internal antenna can be provided. These are ideal for TV studios with ranges around 100m. Others with external antenna are available for outdoors purposes such as OB vehicles at sporting events that need hundred of meters.

Each point of access can be used for up to eight beltpacks. If more than 8 are needed for a certain area, other points of access will need to be placed (8 beltpacks per point of access).

On the other hand, any beltpack can be assigned to more than one point of access in order to provide free movements along different areas.

Number of beltpacks and coverage area can be increased by the linking of points of access as if repeaters or by the use of amplifiers for wider areas.

Configuration, monitoring and maintenance are done via user interface at front panel of base station. Assignment of a beltpack to a port of the base station is done easily via computer software. This flexibility will allow user to make quick modifications.

Crosspoints are implemented at the base station with standalone mode or at the external matrix (analogue or digital) when integrated with other systems.

Base station is provided with a local matrix of 12x12, able to establish crosspoints among any type of its ports: between beltpacks, routing audio from any analogue port to the beltpacks, etc.

This 12x12 matrix will handle crosspoints with standalone mode. Anyhow it can also be used when integrated with external systems.

1.2 BASE STATION

TW7100R01 is provided with:

- Four Ethernet ports for up to four wireless beltpacks.
- Four digital ports for connecting to TB7000, Kroma digital intercom. Connection is done by CAT5 cables (4 twisted shielded FTP pairs) and RJ45 connectors.
- Four analogue ports for connecting to analogue intercom systems (Kroma TB6500 or other). They can be used as I/Os for 4-wire audio signals. Connection is done by 3-pair cables (twisted and shielded) and SUB-D9 connectors.
- 24-bit codecs with decimation and interpolation techniques.
- Headset port with mini-XLR connector at the front panel for audio monitoring (with level potentiometer) and communication with each beltpack separately.
- User interface: LCD and keyboard. With beltpack status monitoring.
- Multirange external power supply and ON/OFF switcher at the rear panel. Power redundancy is optional.
- A compact design for a quick rack-mounting.

1.3 BELTPACK

TW7100R02 is provided with:

- The ability of sending and receiving audio from the base station through WIFI connection of a net point of access. Transmission/Reception of audio and data is done through IP packages. Coverage area will be limited to the distance to this point of access. Points of access supplied by Kroma can provide 100+ meters of range in open spaces. Antenna with greater gain and amplifiers are also available.
- Leds for connection, level and battery status monitoring.
- Level potentiometer for incoming audio with mute and multiturn features.
- Mini-XLR connector for headset.
- A Lithium internal battery with autonomy of more 6+ hours in normal conditions and an external AC multirange charger. Note 5 hours for a complete charging.
- Aluminium chassis for a greater robustness.

1.4 TECH SPECS

BASE STATION TW7100R01

Dimensions	RACK 1RU/19", 190mm deep
Weight	2,3Kg
Power	external DC, +5v, +12v, -12v (optional redundancy)
Consumption	<18W
Amplifier of mic	+50dB to +75dB (input –63dB)
Power of mic	electrect 5v, 1k impedance
Amplifier speaker	1W at 4Ω
Connection	RJ45 for net and digital ports SUB-D9M for analogue ports
I/O network	Ethernet 10/100BT, ***Baud rate 10KB/s***
I/O digital	44,1Khz sampling, 16 bits audio + 8 bits data
I/O analogue	Nominal level 4 dBv Max level 10 dBv Impedance 600Ω output, 15KΩ input Bandwidth 150Hz-10kHz SNR > 80dB THD < 0.3% at 4dB
Interface IP (Kroma)	Protocol TCP/IP, port UDP, with PRTP
Interface control	Data RS-232, 115,2Khz, no parity, 1 stop

BELTPACK TW7100R02

Dimensions	[33 x 80 x 115]mm
Weight	390g (without headset)
Power	1 Internal Lithium Battery 7.4v, 2200mA
Charge of battery	DC +15v, with external power supply, 5-6 hours
Consumption	<2W
Autonomy	>6 hours of standard use
Differential input mic.	-19dBm Max.
Common input mic.	-6dBm Max.
Power mic.	electrect 3.3v, 30k max impedance
Amplifier of speaker	Max 5dBm, with load >100Ω
Connection	Mini-XLR 6p, audio Jack, power

Radio

Standard	IEEE 802.11b
Frequency	2.4Ghz
Data speed	Till 11Mbps, with auto adjustment of fall
Modulation	CCK(11/5Mbps), DQPSK(2Mbps), DBPSK(1Mbps)
TX Power	Typical 16dBm
RX Sensitivity	1Mps -> -92dBm, 2Mps -> -89dBm 5,5Mps -> -87dBm, 11Mps -> -82dBm
Antenna connector	1 x RP-SMA [Reverse SMA]

Figure 1.1 TW7100

2 INSTALLATION

A proper functioning of TW7100 will be managed by the location of wifi points of access. The required area to cover will determine their strategic configuration & placing.

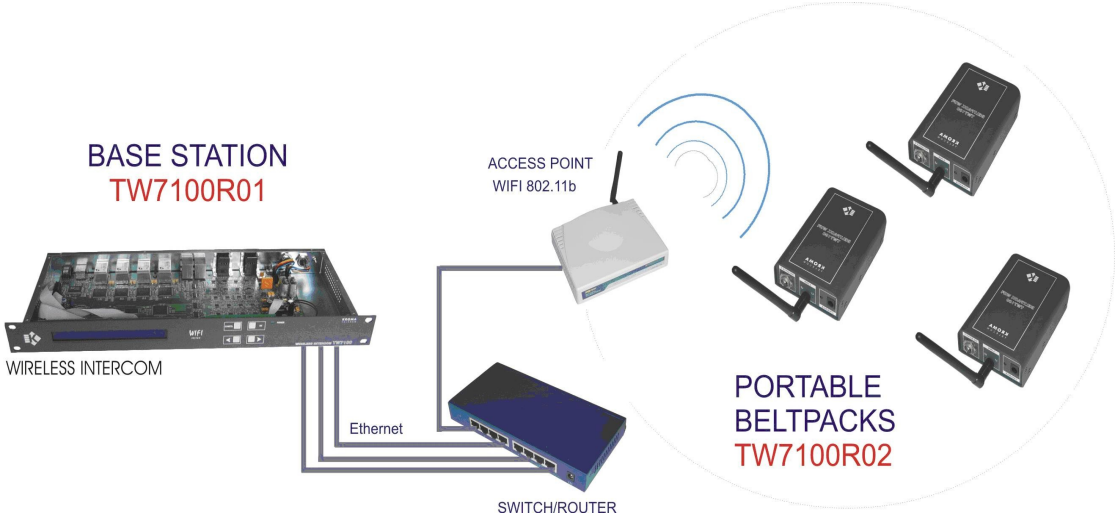
2.1 SYSTEM DESIGN

This system requires a local area network (LAN) of Ethernet-type in order to interconnect the net ports of the base station and the wireless beltpacks. These beltpacks will be integrated into the system with one or several wifi points of access that will be placed in the operations area in order to provide proper coverage.

There are other elements like hubs, switches, routers and other IP equipments that are available for creating LAN networks. A computer is also needed for configuring & monitoring.

The most common system configurations will be described below: from standalone system to its integration with other external systems and the use of repeaters.

Figure below displays a basic wireless system TW7100 that consists of one base station and three beltpacks working in the same physical coverage area (a TV studio).



Picture 2.1 Basic configuration

Elements: base station + switch + point of access + beltpacks

Base station works with three Ethernet modules connected to a switch with one wifi point of access. This one provides wifi coverage to the three beltpacks. This way an Ethernet network is created between NET ports of the base station and the switch and its point of access.

Beltpacks will work as long as they are under coverage area of point of access. Crosspoint map is implemented in the internal matrix of the base station.

Therefore coverage of each beltpack will be limited by the distance to its point of access. This feature allows user to place as many points of access as needed in order to provide coverage to different areas.

A more complex configuration will allow user to interconnect TW7100 wireless system to an external intercom (analogue or digital). It can also work with the possibility of wireless beltpacks moving to a different area.

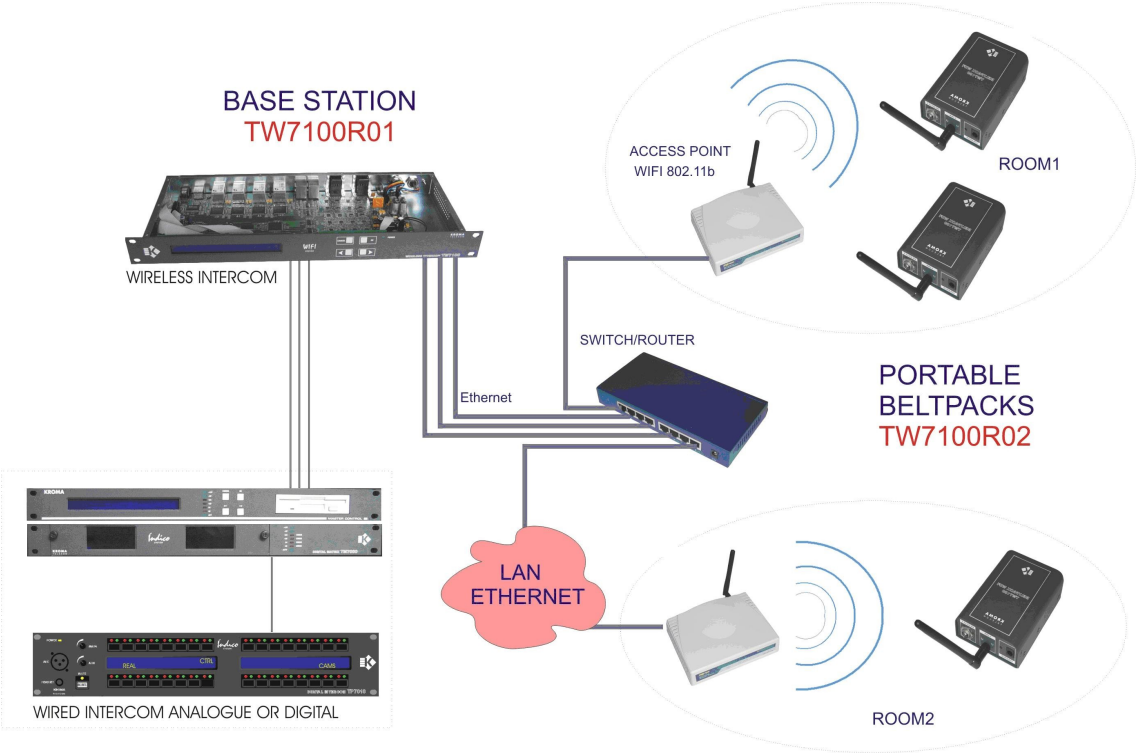


Figure 2.2 Configuration with an external intercom system

Two beltpacks are under one point of access (ROOM 1) while a third one is in another area (ROOM 2). Anyhow, all beltpacks can move freely between these two areas and remain operative.

When a beltpack moves from one area to another point of access, an auto–recognition process will take place. As it takes a few seconds, beltpack will be non operative meanwhile.

Points of access covert wifi radio signal into Ethernet electrical. Both points are connected to one switch that integrates them to the Ethernet ports of the base station (NET).

As base station is interconnected to an external system, beltpacks can establish communication among them and with fixed user panels of this external system.

In this case, the crosspoint map implemented at the external matrix will manage the communication channels to be established. Anyhow, matrix of base station will be available for other required crosspoints.

Should more than four beltpacks be needed, another base station will be required. See below a wireless system with 2 groups of 4 beltpacks each.

System is interconnected to an external matrix so all eight beltpacks can talk/listen among them and towards any user panel (depending on the configuration of the crosspoint map).

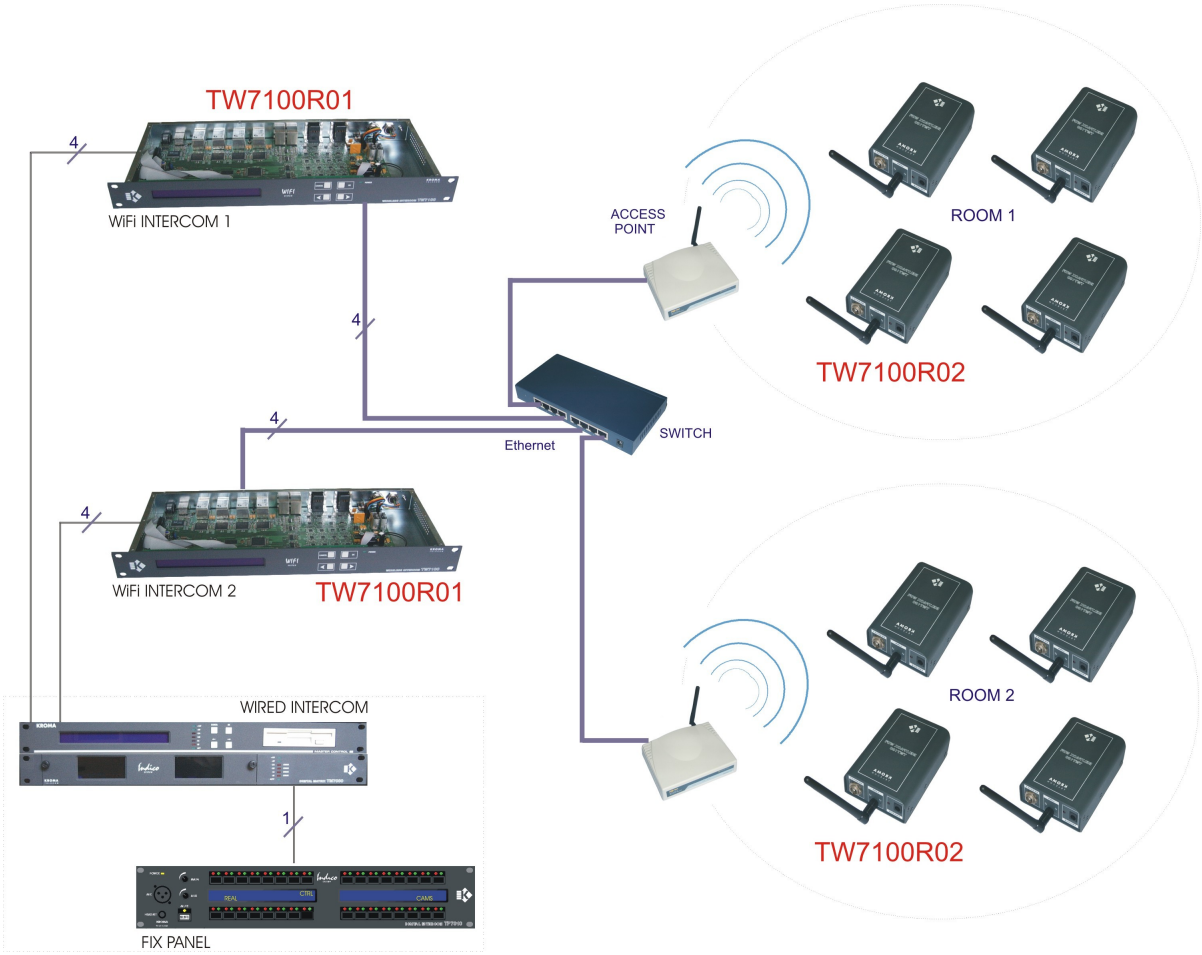


Figure 2.3 Drawing for system with 2 base stations

Base stations are not connected directly but through an external matrix. There is no physical link.

Each group of 4 beltpacks will operate under the coverage provided by the point of access. Should all 8 beltpacks move freely between these 2 areas (ROOM 1 and 2), points of access should be configured similarly in order for each one to provide coverage to these all 8 beltpacks.

Each and every beltpack will be assigned to both points of access. This way they can be operative in both areas. There is no need for the user to indicate this change of area as they are done dynamically. Either one or the other point of access will provide coverage to the moving beltpack. User will move away from one point of access and therefore lose coverage that will be recovered once they enter to the other point of access coverage.

Coverage in this case is not overlapping as points of access are separated between them. Should there be two points of access located in one area, they must be configured in different wifi channels, with a 4-channel gap between them. That is, if one is configured at channel 1 the other must be at channel 5.

A point of access can be used as a repeater of the radio wifi signal, not as link between beltpacks and base station. This use is aimed at certain venues such as football stadiums which offer wider areas to cover and difficulties for cabling all the distance to the point of access that provides coverage to the beltpacks. Wifi signal is carried from the closer point of access to the base station outside the course by “jumping” from point of access (repeater) to point of access.

It is advised not to connect other wireless equipments to the point of access apart from Kroma ***TW7100 beltpacks***. Also note that ***8 beltpacks max per point of access*** are recommended. Speed of the point of access should be at 54Mbps (IEEE 802.11g).

For a proper functioning, IP addresses will be assigned to each part of the system apart from configuring the UDP audio port to be used for communications and the parameters of point of access, etc.

2.2 NET ELEMENTS

Communication between base station and beltpacks is established by IP protocol, using data packages that are sent & received by two types of net: Ethernet between base station and point of access and WIFI between point of access and beltpacks.

IP data are sent from base station via Ethernet ports towards a switch that will route them to the point of access. This one will transmit them as wifi towards the beltpacks.

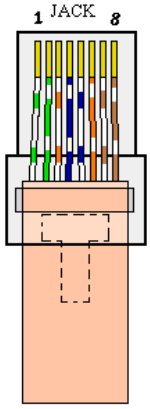
WIFI point of access provides coverage to the beltpack and integrates it within the Ethernet part of the wireless system. It gathers data packages by radio and sends them to the base station by Ethernet. At the same time it converts audio coming from base station to wifi in order to send it to the wireless beltpacks assigned to it.

One switch minimum will be necessary for Ethernet routing and one point of access for wifi coverage. These options can be supplied by Kroma under the following codes: switch TW7100X06 and points of access TW7100X02 TW7100X03.

Location of point of access is critical for proper coverage, as working area needs to be covered. So, before selecting a point of access, user must check the area to cover.

*** TW7100X06*

It is an Ethernet switch for network ports. A pin-to-pin CAT5 cable connects NET ports of base station to this switch.



PIN	COLOUR	FUNCTION
1	WHITE/GREEN	TX +
2	GREEN	TX -
3	WHITE/ORANGE	RX +
4	BLUE	NOT USED
5	WHITE/BLUE	NOT USED
6	ORANGE	RX -
7	WHITE/BROWN	NOT USED
8	BROWN	NOT USED

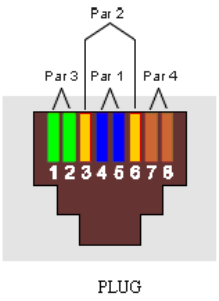


Figure 2.4 Pinout for connection to Ethernet port

Its front panel shows leds for status & power monitoring. Power led will be on when switched on. Port status leds will be on when signal is detected and will flicker when there is data package traffic.

Figure 2.5 I.E. Switch Ethernet 8 ports

NB: *It does not require any software configuration as its routing is transparent to the end user.*

External 12-volt power supply by jack connector is provided. See 4.2 chapter for its electrical specs.

** *TW7100X02*

WIFI point of access that provides coverage for up to 8 beltpacks. It has an internal flat antenna for an easier wall-placing. Place it towards the area to be covered.

It is also provided with an Ethernet connector with the same pinout as shown above for the switch.

Figure 2.6 Point of access with internal antenna

Power is provided by a POE injector (power over Ethernet) so as to avoid local power supply. This device provides power to the point of access by the free pins of cable.

The injector comes with the point of access as an accessory and it provides 100-240V AC input voltage. It has also one Ethernet input from the switch and one Ethernet output for the point of access.

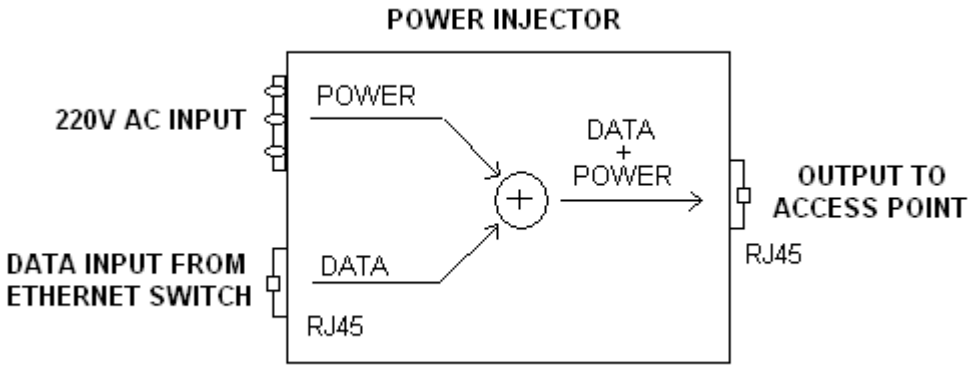


Figure 2.7 Power injector for the point of access

NB: Distance between point of access and injector will be up to 100 meters.

Tech specs of point of access are described at chapter 4.2 (accessories).

Parameters are configured by Kroma as standard so it can be checked and used initially with no prior management. These settings can be modified by the user in terms of network identifier (SSID), WIFI channel, encryption, etc.

For modifying these parameters, use a web browser of a computer connected to the wifi sub-net. Enter IP address of point of access (192.168.7.220) and '**admin**' as user and '**user**' as password. By default, WIFI net is configured as open (not secured) and 'INTERCOMWIFIx' as SSID, where this 'x' changes according to the order.

NB: Should more than one point of access be provided, they will be preconfigured with same user and password but consecutive IPs. *Example: 192.168.7.220, 192.168.7.221, 192.168.7.222, etc…*

Figure below shows an example of the configured parameters of the point of access.

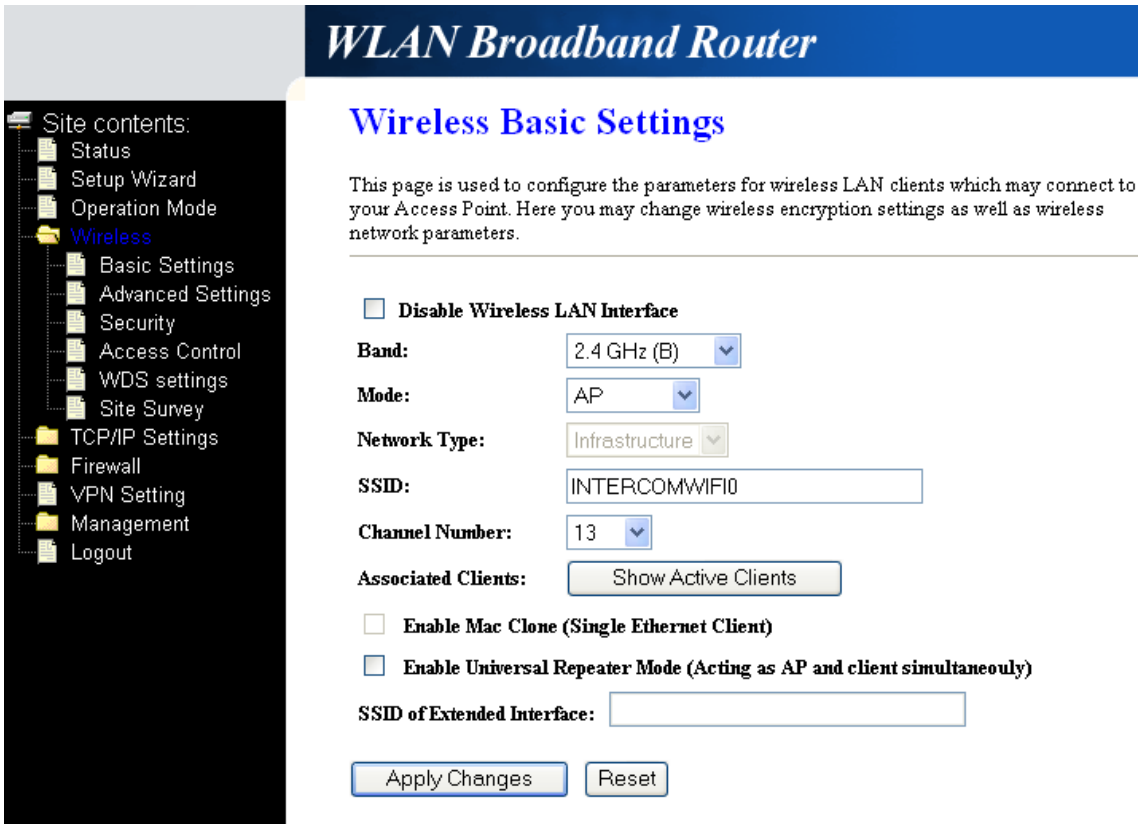


Figure 2.8 Configuring of access point parameters

** *TW7100X03*

WIFI Point of access for providing coverage to 8 beltpacks max. It is provided with an N-type female connector for any required external antenna (omnidirectional for pole, directional for grill, etc).

It is also provided with an Ethernet connector with the same pinout as shown above for the switch. A reset button will allow user to reboot this equipment if necessary.

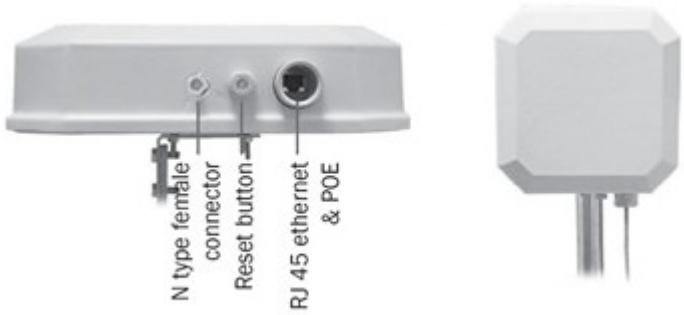


Figure 2.9 Point of access with external antenna

Power is provided by a POE injector (power over Ethernet) so as to avoid local power supply, as seen about TW7100X02. The injector comes with the point of access as an accessory and it provides 100-240V AC input voltage. It has also one Ethernet input from the switch and one Ethernet output for the point of access.

NB: *Distance between point of access and injector will be up to 100 meters.*

Tech specs of point of access are described at chapter 4.2 (accessories).

Parameters are configured by Kroma as standard so it can be checked and used initially with no prior management. These settings can be modified by the user in terms of network identifier (SSID), WIFI channel, encryption, etc.

By default, WIFI net is configured as open (not secured).

2.3 BASE STATION

For rack-mounting, it is advised (not mandatory) to leave 1U high above this equipment for ventilation purposes.

An external power supply AC/DC is provided and is connected to the any POWER-labeled connector (A or B) on the rear panel of the base station. Redundancy is available.

Power connectors are provided with a special twist so as to avoid accidental disconnection in dynamic environments.

Once power is connected, switch the equipment on. A vertical switcher is placed next to the power connectors. Turn it off when base station is not being used.

***NB**: It is advised to disconnect power supply when doing the installation (racking, cabling). Once done, plug the power supply.*

Figure 2.10 rear view of base station TW7100R01

Base station handles IP data packages from and to beltpacks. They are received by Ethernet ports (NET labeled on its rear panel).

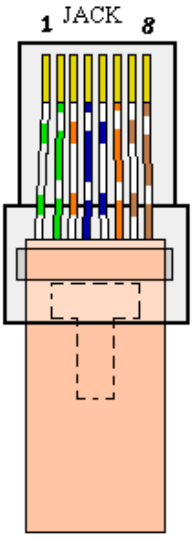
There are four available net ports for Ethernet connection. It is advised (not mandatory) to use a dedicated network for the wired elements of the system.

A shared network might be congested in certain heavy traffic moments. Then IP audio packages might not find the necessary bandwidth because other network equipments are causing delays, collisions or cuts, *so it is advised to use a dedicated network*.

System allows up to four beltpacks that need to be configured for working with a dedicated network port of the base station. Number of beltpacks will indicate number of cables between switch and base station.

It is advised to begin with “NET 0”-labeled port, then “NET 1”, “NET 2” and finally “NET 3” for 4 beltpacks.

A physical Ethernet line should be connected to the NET-labeled ports. These should be of CAT5 type (pin-to-pin 8-wire twisted pair) with RJ45 connectors. See pinout below:



PIN	COLOUR	FUNCTION
1	WHITE/GREEN	TX +
2	GREEN	TX -
3	WHITE/ORANGE	RX +
4	BLUE	NOT USED
5	WHITE/BLUE	NOT USED
6	ORANGE	RX -
7	WHITE/BROWN	NOT USED
8	BROWN	NOT USED

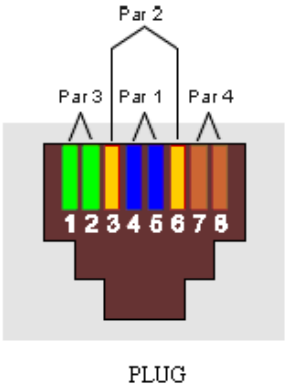


Figure 2.11 Pinout for connection to Ethernet port

There are two leds per NET port: orange for Ethernet connection and green for data package traffic.

NB: *Once cables are connected, confirm Ethernet connection by checking these orange leds.*

LAN-labeled connector is aimed at diagnosis & monitoring. It is a future option of this equipment.

For interconnecting the base station with external intercom matrixes, *physical cables need to be installed per port* (analogue or digital) to be used at the base station.

If wireless system works standalone, there is no need for more cables to any external matrix (unless analogue ports are being used for other purposes: patch panel, speakers, pgm return signal, aux inputs, etc.)

For interconnection to Kroma digital matrix (TM7032 or other model), use digital ports of base station. For interconnection to any analogue intercom matrix (TM6508 or other brand), use analogue ports.

CONNECTION TO DIGITAL MATRIX

Cables coming from Kroma digital matrix will be connected to RJ45 connectors with “DIGITAL PORTS” label by CAT5 cable (***pin-to-pin*** 8-wire twisted pair FTP). Max cable between digital matrix to base station: 300 meters.

Chart below shows pin functions of RJ45 connectors for the digital ports (numbered from 0 to 3) of the base station:

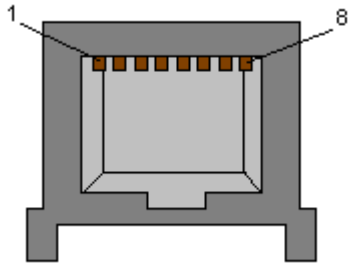


Figure 2.12 PCB RJ45 connector

RJ45 PCB	FUNCTION TW7100
1	Reserved
2	Reserved
3	TX_DATA +
4	RX_DATA +
5	RX_DATA -
6	TX_DATA -
7	Reserved
8	Reserved

Chart 2.1 Pinout of digital connector RJ45

Pinout for digital port cable is as follows:

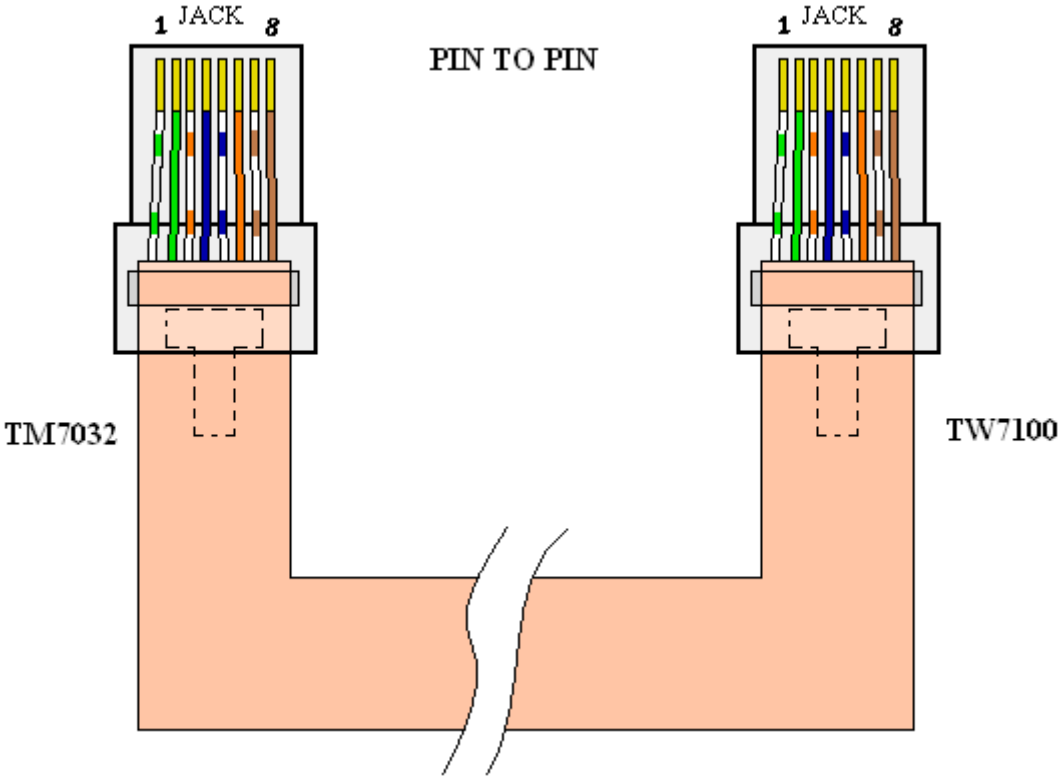


Figure 2.13 Pinout for digital ports cable between matrix and base station

It is advised to use 8-wire twisted-pair FTP CAT 5 cable for data transfer. One end is connected to RJ45 plug of digital matrix while the other to the desired digital port of the base station.

If connected to a digital matrix, analogue ports become aux input/outputs. They can be configured separately to interact with beltpacks and even with digital ports.

NB: *For more info on Kroma digital intercom TB7000 check its technical manual TB7000D02 (provided with CD)*

CONNECTION TO ANALOGUE MATRIX

There are four male SUB-D9 connectors labeled as “ANALOG PORT” and numbered from 0 to 3. They are aimed at integrating base station with TB6500 Kroma analogue intercom system or with any other brand. They convey audio & data according to following pinout:

SUB-D9 MALE	FUNCTION TW7100
1	Data -
2	Data +
3	GND
4	OUT analog audio -
5	OUT analog audio +
6	GND / +12V
7	IN analog audio -
8	IN analog audio +
9	GND / -12V

Chart 2.2 Pinout of analogue port

Pins 6 and 9 of each connector of the base station are configured as ground (GND) but, optionally, they might carry positive and negative voltage in order to power external equipments.

For implementing this option, SMD soldering jumpers need to be modified (see J14, J16 of printed circuit for ports 0, 1 and J15, J17 for ports 2, 3). *Contact tech support for more info.*

Cable between base station and analogue matrix will have a male SUB-D9 connector at matrix´s end and a female SUB-D9 at base station´s end. With the following pinout:

PIN	SUB-D9 MALE TO MATRIX	CONEX PIN-PIN	GROUP WIRES	PIN	SUB-D9 FEMALE TO BASE STATION
1	DATA -	1-1	C	1	DATA -
2	DATA +	2-2	C	2	DATA +
3	GND	3-3,6,9	C	3	GND
4	IN analog audio -	4-4	A	4	OUT analog audio -
5	IN analog audio +	5-5	A	5	OUT analog audio +
6	+V			6	GND
7	OUT analog audio -	7-7	B	7	IN analog audio -
8	OUT analog audio +	8-8	B	8	IN analog audio +
9	-V			9	GND

Chart 2.3 Pinout for interconnecting base station and analogue matrix

A reference cable is LAPP KABEL UNITRONIC Li2YCY PiMF 0034046 3x2x0.34.

Note that pins 3, 6, 9 of each analogue port of the base station need to be soldered among them and interconnected to pin 3 of analogue port of matrix side in order to add their grounds. Leave then not connected pins 6, 9 at matrix side as they are for power and they should not be connected.

NB: *For more info on Kroma analogue intercom TB6500 check its technical manual TB6500D01 (provided with CD)*

Max distance advised between base station and analogue matrix is 150m. Noise and data failure transmission might appear with greater distances.

Kroma wired beltpacks BP6000 can be connected directly to these analogue ports. Just use pins 6, 9 of +12V/-12V of analogue ports of base station after having modified the internal soldering jumpers.

When used as aux audio input/outputs, connect only pins IN, OUT y GND.

Base station is provided with local monitoring of the wireless beltpacks. User can also talk to them individually or all together. Selection is done via LCD & keyboard user interface of base station.

Figure 2.14 Front aux audio port

This headset connector is provided with a multi-turn volume potentiometer. An audio signal appears if reached min and max levels. Press it to mute microphone audio into the base station. An orange led on will indicate mute position. Press again for “un-muting”.

This audio input/output is aimed at headset connection. It must be with *‘electrect’* microphone (5v). Audio output can be used for two speakers (500mW at 8Ω max).

See below pinout for the headset. Kroma has several models available for direct use.

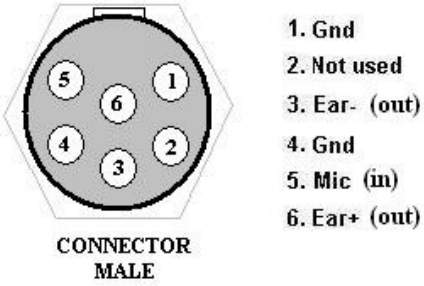


Figure 2.15 Headset connection

2.4 BELTPACK

When unpacking, double check that each beltpack has been supplied together with a power supply for battery charging, wifi antenna and headset.

Each beltpack departs from factory already configured to work with a specified network port of the base station. User might modify these parameters in order to make it work with a different port.

As a wireless device, the only requirement for its integration into the system is its location within the coverage area of its point of access.

External antenna is provided with a connector of 'SMA Reverse' type. It is advised to turn it into the beltpack (LINK-labeled connector) manually and until its end. *Do not place any obstacle before the antenna* for a proper reception of wireless signal.

Antenna must be positioned vertically and downwards (or pointing outside). Both ways reception is similar.

Internal battery of the beltpack allows 6+ hours of autonomy. When discharged, POW-labeled led flickers advising recharging by external power supply.

Before switching it on, it is advised to charge it completely as it might reach slightly discharged due to distribution conditions.

Once connected to the external power supply, "CHARGE"-labeled led will be ON till full charging. Brightness of this led will decrease until it finally reaches OFF status. Then disconnect power supply. Let 5-6 hours to fully recharge the battery.

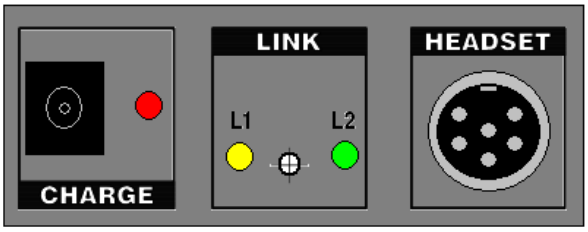


Figure 2.16 Beltpack – rear view

Beltpack is provided with mini-XLR connector (labeled as “HEADSET”) for headset with electrect microphone input and headset output.

Kroma can supply several models of headsets. Enter headset female connector into beltpack male connector until it “clicks” so it has been tightened safely.

For disconnecting headset, press connector’s little label and unplug it.

For switching beltpack on, use ‘ON/OFF’ button. POW led will be lit, meaning it has necessary internal power.

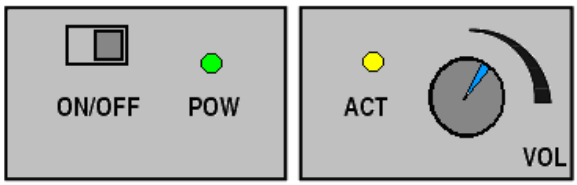


Figure 2.17 Beltpack – front view

Once on, if beltpack was configured properly and it is within range, L1 led (“LINK”) will be lit after 20-25 seconds, meaning wifi channel has been established. A flickering led means that beltpack cannot connect to point of access.

To turn the beltpack off, place its switch to OFF position. ACT-labeled red led will be on, meaning that beltpack will disconnect from the system in a few seconds. After that, all leds will be off.

See chapter 3.1.1 for configuring network parameters.

3 USER

3.1 BASE STATION

It is provided with four IP links for connecting up to four wireless beltpacks. They allow four simultaneous and independent conversations. Each IP port is activated via password (code TW7100X01), that will be requested depending on their need for wireless beltpacks.

Base station includes four Ethernet modules that handle IP data packages from wireless beltpacks. Each IP port establishes a univocal channel with each beltpack. This makes audio communications can be done individually.

Base station is provided also with digital and analogue ports that allow its integration with other wired systems like Kroma digital intercom TB7000, Kroma analogue intercom TB6500 (or similar).

Connection to TB7000 digital intercom is established by four independent digital ports and configuration is done from Indico software. At the same time, it can be connected to TB6500 analogue intercom by its analogue ports that are configured from MAP6500 software.

Anyhow, base station includes a simple matrix for making any needed crosspoints among analogue, digital and wifi ports.

Front panel is provided with a ‘POWER’ led (green when switched on).

Figure 3.1 Base station – front view

For configuring and monitoring, user interface consists of an LCD and keyboard at the front panel. At the right side user is provided with a headset connector and a level potentiometer for audio monitoring.

Functions of four front keys:

- 'OK' ➔ for validating or entering a menu.
- 'CANCEL' ➔ for canceling or moving backwards to previous menu.
- '=>' ➔ for moving right / down the selection cursor.
- '<=' ➔ for moving left/up the selection cursor.

When switched on, display will show 'Initializing…' indicating internal processing. If no error is detected, the following message will appear (name of wireless system, running software version, beltpacks status and current configuration map):

Figure 3.2 First screen of base station

Beltpack status can be watched quickly with icons near "BPs:". Nomenclature is:

- □: Network port locked.
- ▮: Network port available. Beltpack is offline.
- 0,1,2,3: Network port available. Beltpack #Number is online. (In the image: beltpacks #0 and #1 are online, beltpack #2 is offline, and port #3 is locked)

In case of internal configuration mistake, disconnect and plug power cable. If it persists, contact Technical Support.

Find below available functions.

NB: *LCD messages that appear in this manual are in English. Spanish and English languages are options.*

Press <OK> once for entering main menu:

- (1) Audio management
- (2) Port status
- (3) System configuration
- (4) Reset

Apart from fourth option (reset), each one will show submenus that are being explained below:

- (1) Audio management

First menu handles audio of base station. Press <OK> for available options within this menu: making crosspoints among wireless beltpacks, local audio monitoring at the front panel, analogue and digital audio; and configuration map management.

Figure 3.3 Main menu

For establishing communications between available beltpacks, analogue, digital audio or local audio monitoring, go to “Crosspoint assignment” menu. Then select source audio group (DGTL: Digital audio, ANLG: Analogue audio, BLTP: Beltpack, MICR: Local audio monitoring), source port, destination group (same like source group) and destination ports for making a fixed crosspoint between them.

Figure 3.4 Crosspoint menu

Select source group with arrows ‘<=’ and ‘=>’ and then press <OK>.

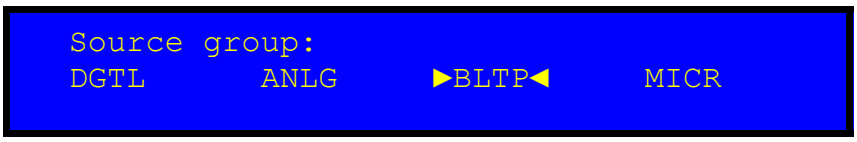


Figure 3.5 Selecting source group

Press <OK> again for selecting source port.

Figure 3.6 Selecting source port

Press <OK> again for selecting destination group.

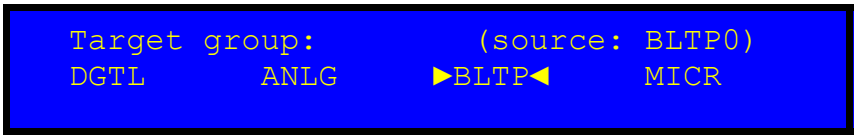


Figure 3.7 Selecting destination group

Select and press <OK> for selecting destination ports.

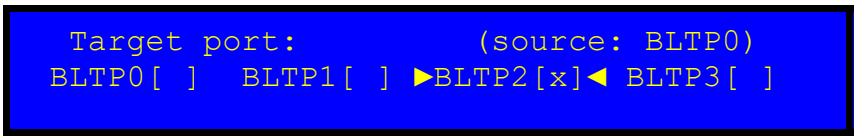


Figure 3.8 Selecting destination ports

Figure above shows that beltpack #2 has been selected for talking with beltpack #0 (source). Audio from beltpack #0 will reach selected beltpack(s).

Once crosspoints have been created, exit all menus. User might save configuration or just use it until base station is switched off. If not saved, this map will be lost with power off.

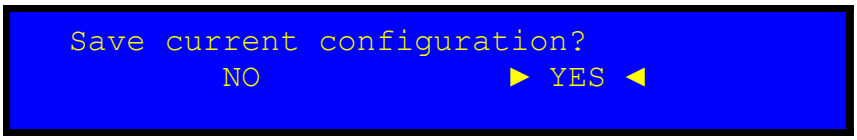


Figure 3.9 Saving configuration

If you select “YES” then you must select one of the four available slots for use it in the future.

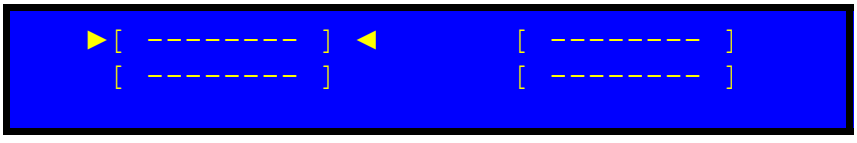


Figure 3.10 Saving configuration in one map slot

If you select local audio monitoring (MICR) as audio source or target, this channel will be audio only. There is no data transmission between base station and wireless beltpacks. A multiturn audio potentiometer is provided for increasing audio gain reaching the headset. Press it for muting audio from headset to beltpacks. Anyhow headset will still audio monitor the beltpacks. Level led will be on when muted. Press again for un-muting.

NB: When max or min level has been reached, an indicating tone will be listened and mute led will flash.

Go to “Load Map” for loading a previously saved crosspoint configuration to use.

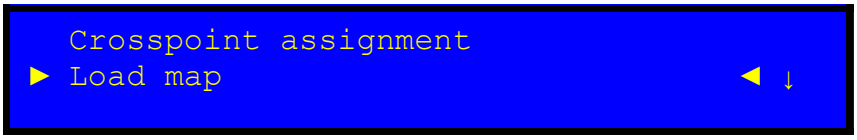


Figure 3.11 Load map

Then select the configuration map to load (“--------“ indicates an empty slot).

Figure 3.12 Configuration map to load selection

“Save map” option saves the current configuration in a slot for future use, avoiding the reprogramation of all the audio crosspoints each time you use the system.

“Delete map” option erases an old configuration map, leaving the slot available for new configurations.

- (2) Port status

This menu is aimed at port status monitoring (net, digital and analogue).

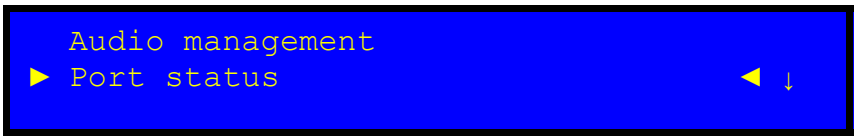


Figure 3.13 Port status menu

Press <OK> for entering submenu:

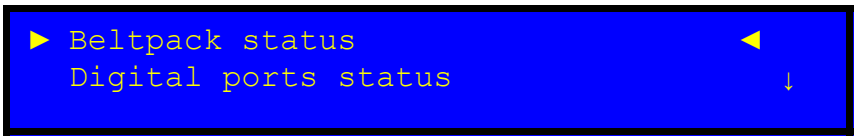


Figure 3.14 Beltpack status menu

First submenu checks beltpack status in real time. It monitors the link with wireless beltpacks assigned to the IP network ports. It is very useful for knowing if any beltpack is operative.

Find below available status messages for the net ports:

- [OK] ➔ Beltpack linked to that port and with an IP address assigned working properly.
- [ERROR] ➔ Beltpack non operative. It might be switched off, not within range, IP address of net port not configured correctly.
- [LOCKED] ➔ Net port is not activated. It can be unlocked with TW7100X01 option. Ask your usual supplier for the code.

See below an example:

Figure 3.15 Beltpack status

NOMENCLATURE: **BP + 'Nr Port' : [Message]**

Second submenu checks digital ports in real time and its connection with Kroma digital matrix. Press <OK> and enter:

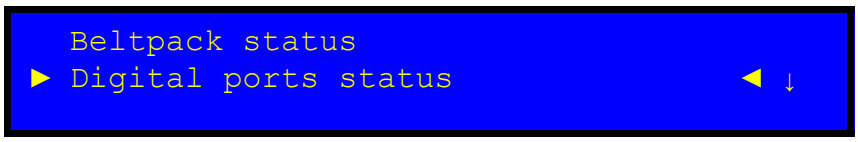


Figure 3.16 Digital port menu

Find below available status messages for the digital ports:

- [OK] ➔ Digital port connected to matrix and working properly.
- [ERROR] ➔ Digital port disconnected or digital matrix switched off.

See below an example:

Figure 3.17 Digital port status

NOMENCLATURE: **DGTL + 'Nr Port' : [Message]**

Last submenu checks analogue ports in real time and its connection with Kroma analogue matrix. Press <OK> and enter:

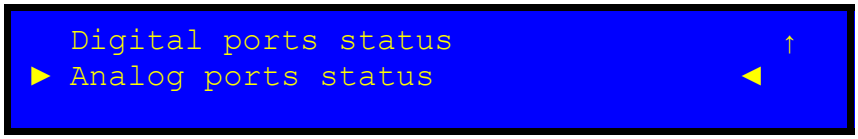


Figure 3.18 Analogue ports status

Find below available status messages for the analogue ports:

- [OK] ➔ Analogue port connected to matrix and working properly.
- [ERROR] ➔ Analogue port disconnected from matrix. This port seems to be disconnected or maybe matrix is swtiched off or not configured.

See below an example:

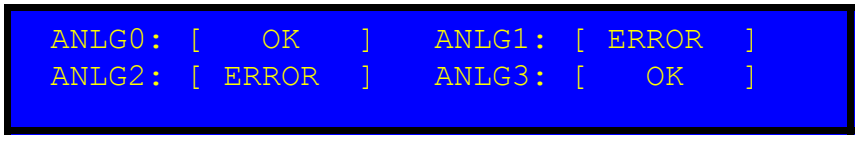


Figure 3.19 Analogue ports status

NOMENCLATURE: **ANLG + 'Nr Port' : [Message]**

- (3) System configuration

This third menu includes user-configurable parameters. Press <OK> for entering submenus:

Figure 3.20 Configuration menu

First one is for selecting 'Language':

Figure 3.21 Selecting language

Press <OK> for selecting Spanish or English and validate with <OK>.

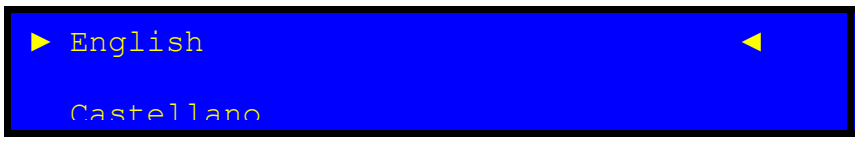


Figure 3.22 Selecting language

'Link activation': See more info on link activation at chapter 4.1.2 (technical maintenance). This menu allows user to activate locked network ports in order to expand the number of wireless beltpacks. A password is used. Ask your supplier on TW7100X01 code.

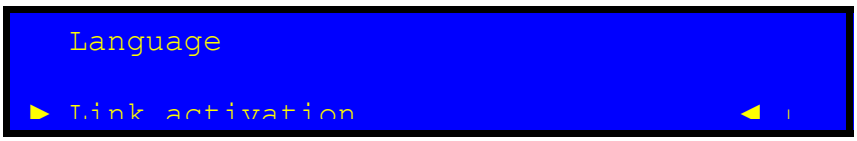


Figure 3.23 Link activation

Next option is 'Firmware Version' that runs the equipment, at the microprocessor (uC) and the ports (FPGA).

Figure 3.24 Firmware version option

Figure 3.25 Firmware version

This option is not used for software upgrade. This is done via serial port RS-232. See chapter 4.1.1 for more info.

Other option, 'NETs Default values', restores selected NET module to factory default configuration. Be warned, if you restores configuration of NET modules, *it can be unreachable*, and you must *reconfigure manually the module* as described in chapter 3.1.1.

Figure 3.26 NETs Default values

When selected, a menu for selecting the desired module to be restored to factory defaults appears.

Figure 3.27 NET port to restore selection

If <OK> is pressed, a confirmation dialog is presented indicating the danger of the operation.

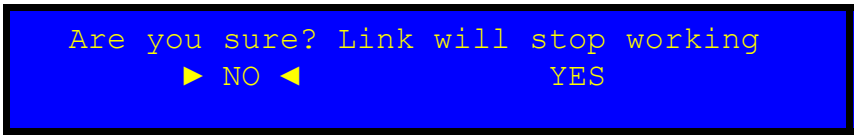


Figure 3.28 NET port reset confirmation

The last option, 'Narrow used bandwidth in', makes in the select nets a little narrow band, that determinate to decrease in the voice packets sends from beltpack. This option is very interesting in the systems installed in the areas with possible interferences in the WiFi radio signal.

Figure 3.29 Narrow Band

Also, this option can be activated when the audio packets IP are be sending to router LAN that not available of the necessary bandwidth. This way, only the packets with variation level (VOX) are sending to the destiny.

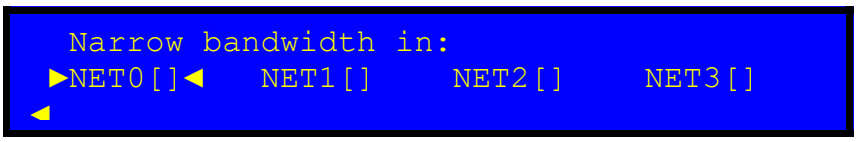


Figure 3.30 Select the Net Port

■ (4) Reset.

The last main menu option is ‘Reset’. Press <OK> for rebooting the system.

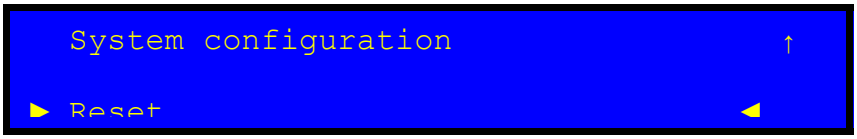


Figure 3.31 Reset menu

Only with a wrong functioning and a blocked On/Off switcher, this option is advised. If crosspoints have not been saved, this configuration will be lost.

3.1.1 NET PARAMETERS CONFIGURATION

When using an IP network (Internet Protocol), univocal IP identifiers must define every equipment of this network, be them base station network ports, points of access and beltpacks.

Each network port of the base station is provided with a local IP address that identifies within the IP network and also a remote one of the wireless beltpack for sending data packages. Same happens with beltpack: it has one identifying IP and a remote one (port of base station, destination of its data packages).

NB: *From now on, we will talk about "network modules" of the base station instead of network ports so as to avoid any confusion with software ports of TCP/IP protocol.*

Should an IP address of a network module be modified, IP address of assigned beltpack needs to be modified as well (in order to avoid losing communication in one way). And viceversa, any IP change at the beltpacks carries also a change at their network modules.

Network modules of base station and beltpacks are preconfigured at factory for a range from 192.168.7.1 to 192.168.7.127 (being the mask 255.255.255.0). IP addresses can be modified with "Digi_Config_IP.exe" software included in the CD provided.

NB: *Whenever an IP address is changed, check if new one is already being used in order to avoid collision conflicts with existing equipments.*

For that, firstly, execute provided software in a computer connected to the network of the wireless system. Have in mind that this application must be habilitated at the firewall (if there is one), otherwise UDP ports will not open and program will not work as ports will not be visible.

Double-click with left button on "***Device_Discovery.exe***" file. A window will open with a "Searching…" message. It will look for IP network modules of the wireless system. See below an example.

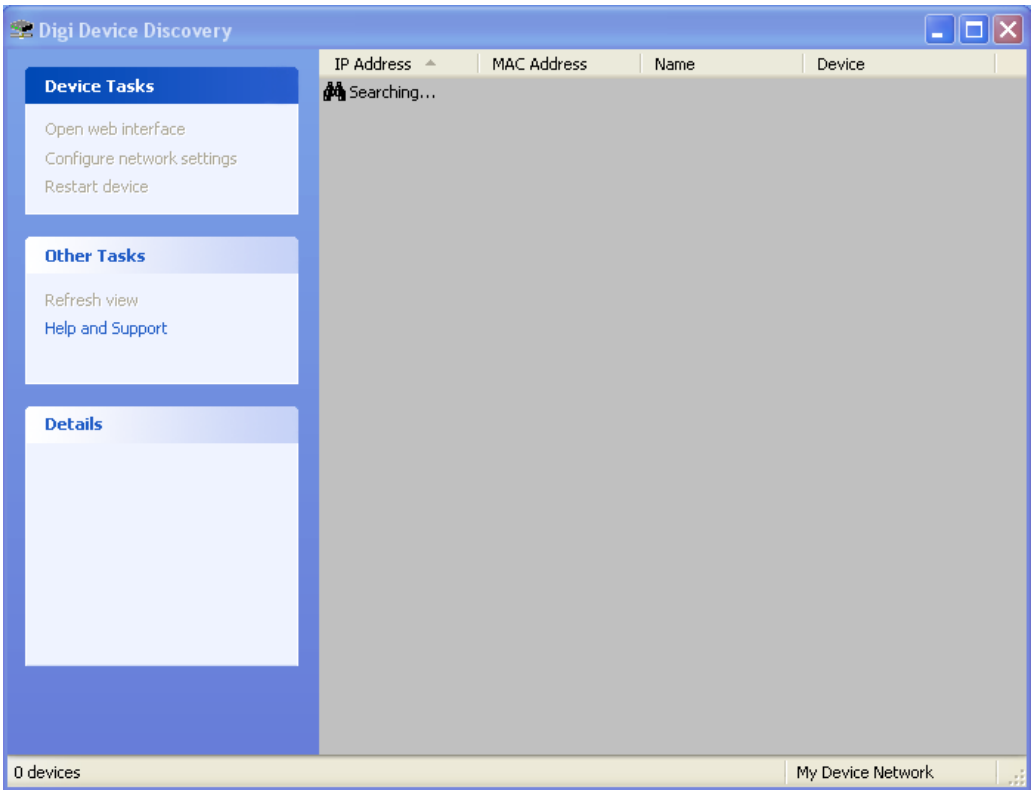


Figure 3.32 Software for monitoring network intercom equipments

A list of connected network modules of base station and beltpacks will appear:

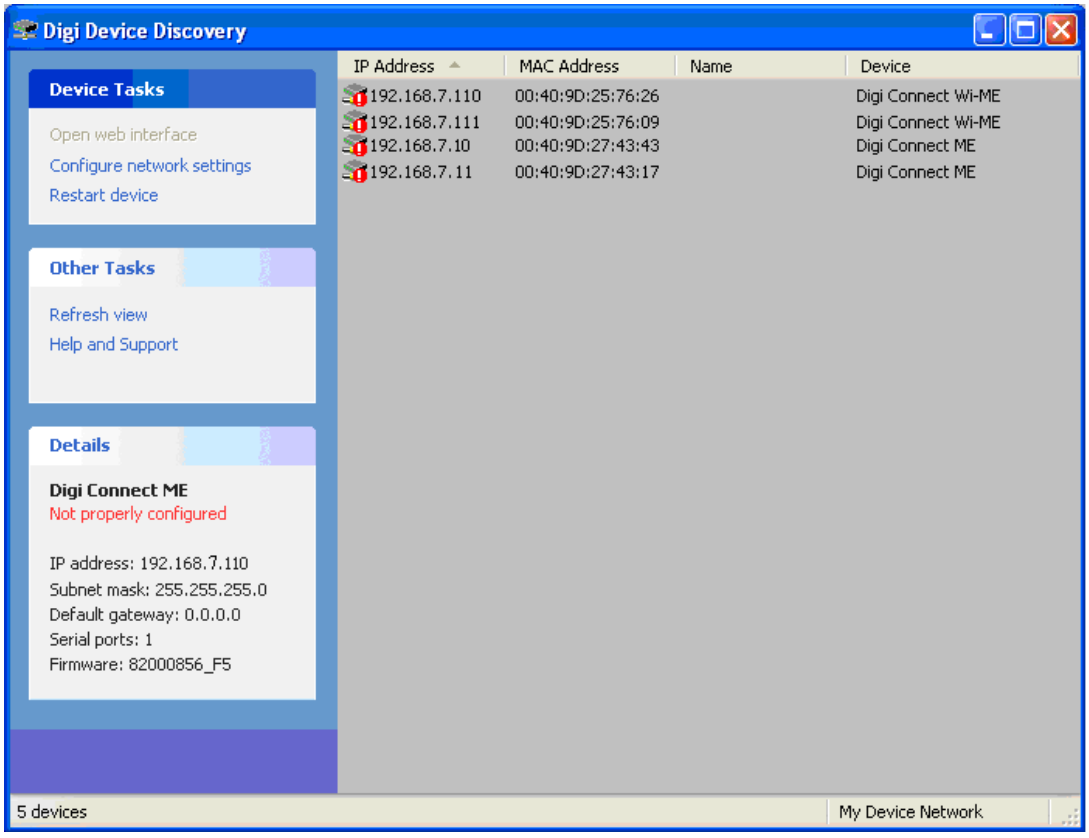


Figure 3.33 Available network modules IP

Detected equipments are listed with the following information:

- **Device** -> Type of equipment. “Digi Connect ME” refers to fixed network module of base station while “Digi Connect Wi-ME” means a network module of a wireless beltpack.

- **IP Address** -> IP address of each device of the network.

- **MAC Address** -> MAC address of each device of the network. It is a fixed one, it cannot be modified by user.

If no data appears, check network properties of the computer and refresh with “Refresh view” option.

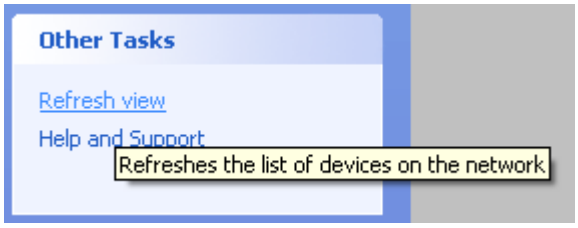


Figure 3.34 New search

For modifying IP address of any network module (beltpack or base station), select the device and press “Configure network settings” option as follows:

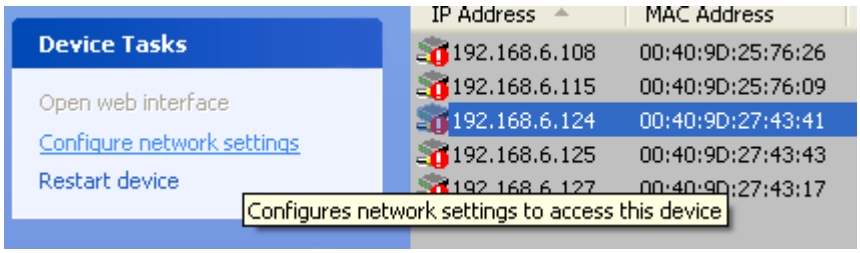


Figure 3.35 Configuring IP address

At the appearing window, IP address, mask and gateway can be modified.

It is advised to set new IP address manually, leaving mask as it is and not entering a gateway unless strictly necessary. User should want these modifications being done automatically, system must be connected to a shared network, where a DHCP server provides this information.

See below an example of configuration:

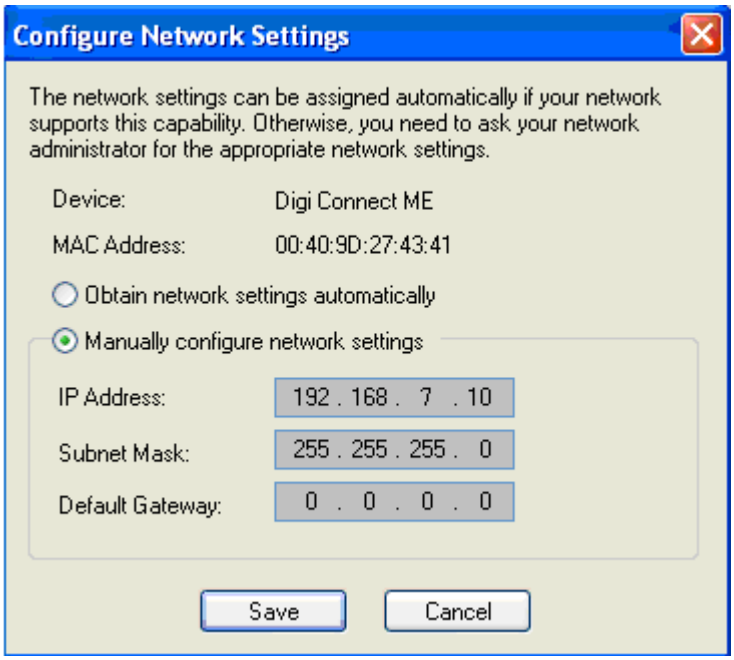

Configure Network Settings
The network settings can be assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate network settings.
Device:
Digi Connect ME
MAC Address:
00:40:9D:27:43:41
Obtain network settings automatically
Manually configure network settings
IP Address:
192 . 168 . 7 . 10
Subnet Mask:
255 . 255 . 255 . 0
Default Gateway:
0 . 0 . 0 . 0
Save
Cancel

Figure 3.36 Modifying IP address

For modifying IP address enter new one at 'IP Address:' and then press 'Save'. Equipment will reboot for setting this new IP address.

This way source IP address is modified. Now destination IP address needs to be changed as well for a two-way communication.

For this, use a web browser to enter the 'web server' of the network module. Enter IP address to be modified as below:

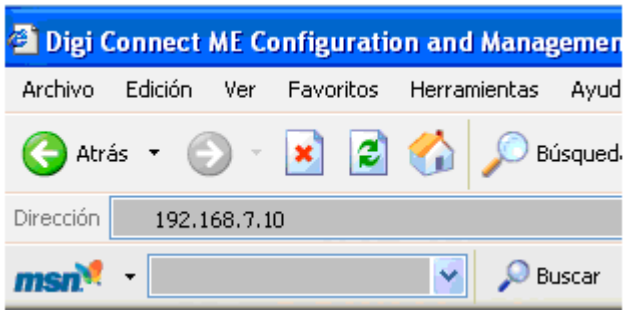


Figure 3.37 Searching web server

Then web server homepage will appear and ID & password will be required.

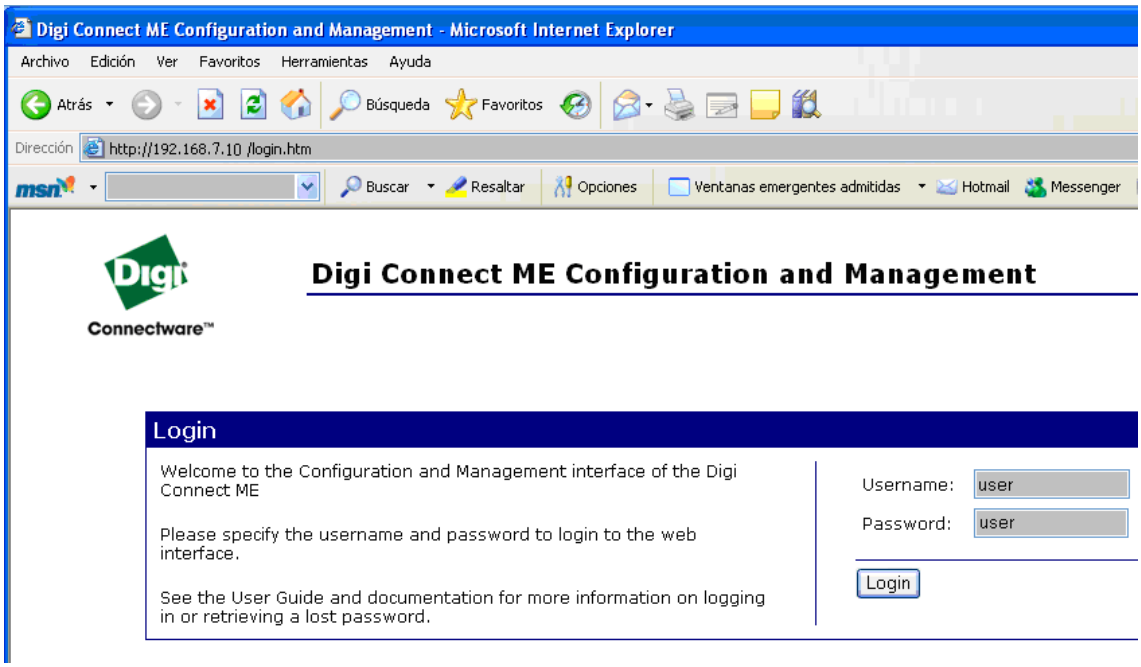

Digi Connect ME Configuration and Management - Microsoft Internet Explorer
Archivo Edición Ver Favoritos Herramientas Ayuda
Atrás Búsqueda Favoritos
Dirección http://192.168.7.10 /login.htm
Buscar Resaltar Opciones Ventanas emergentes admitidas Hotmail Messenger
Digi
Connectware™
Digi Connect ME Configuration and Management
Login
Welcome to the Configuration and Management interface of the Digi Connect ME
Please specify the username and password to login to the web interface.
See the User Guide and documentation for more information on logging in or retrieving a lost password.
Username: user
Password: user
Login

Figure 3.38 Entering base station network module via web server

ID & password are "**user**". Press 'Login' for validating so available options will appear:

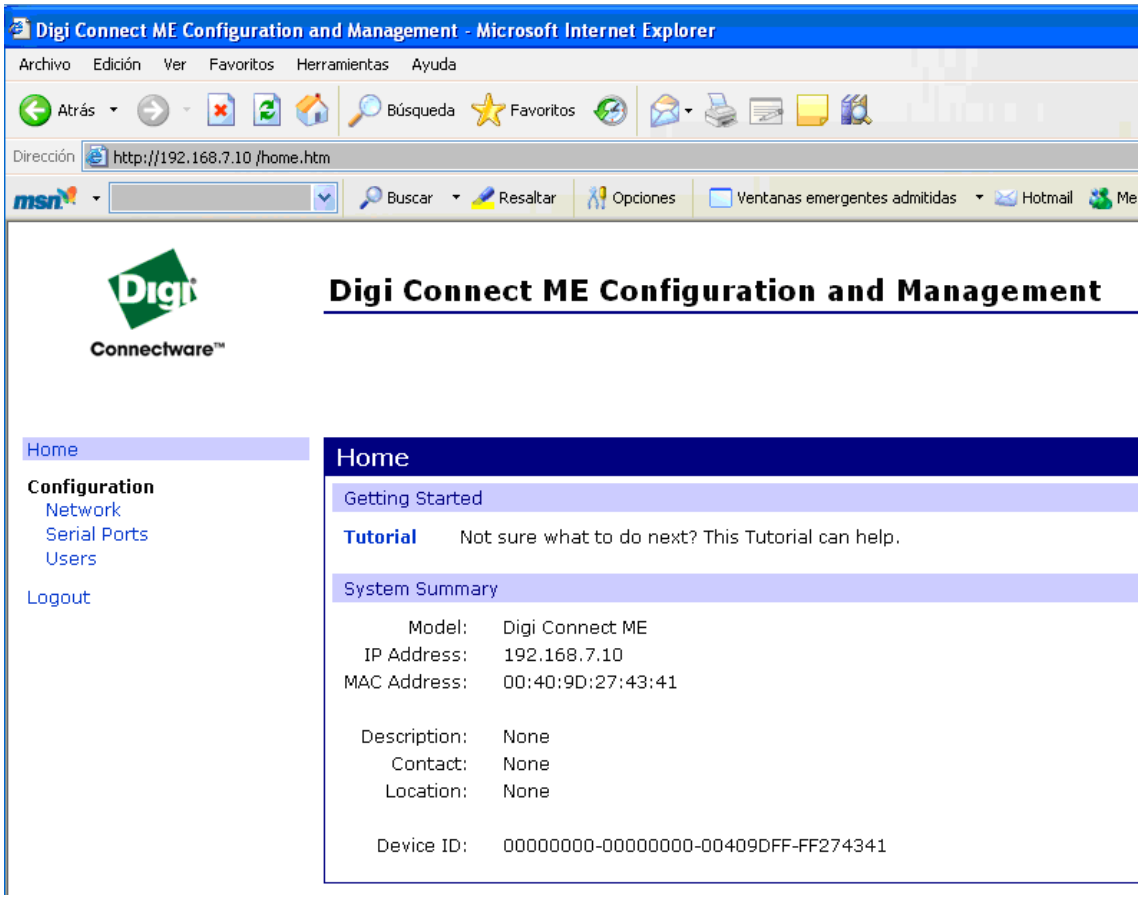


Figure 3.39 Configuring base station network modules

At the right side window, properties of network module of base station will appear: IP and MAC identifiers. MAC address cannot be modified. For changing local IP address, click on “Network” option.

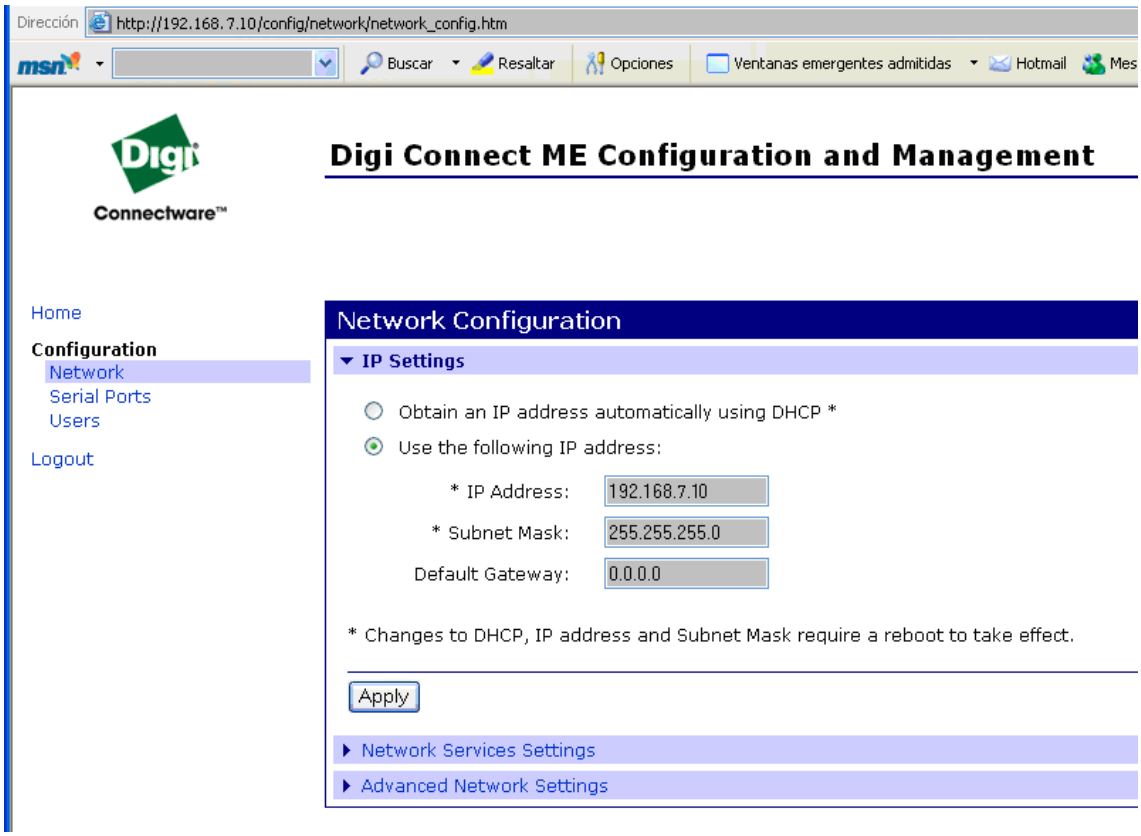


Figure 3.40 Configuring IP address of base station net module

This is a second way of changing IP address, apart from the one with software provided with equipment, is to enter new one at above window and press ‘Apply’ to validate.

For changing destination IP address of this network module, click on ‘Serial Ports’ option on the left side.

A new window will appear with data about an UDP connection by port 1. See below:

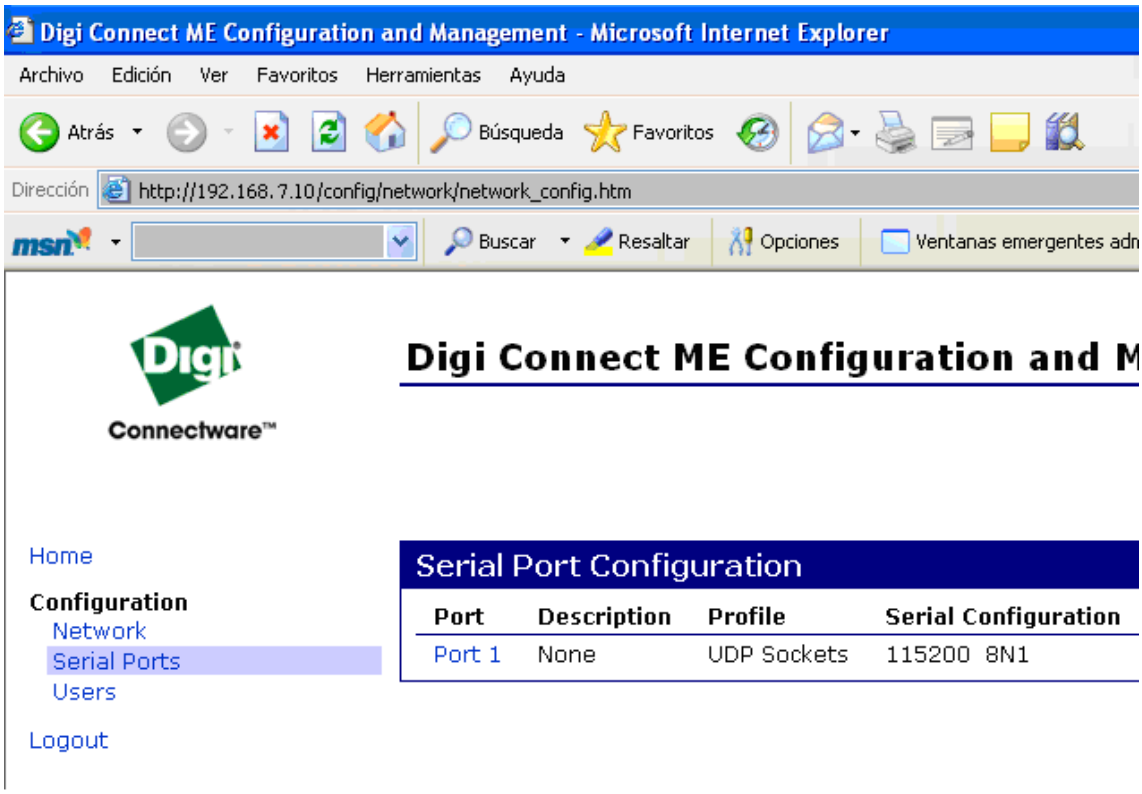


Figure 3.41 Info on port connection

Click on 'Port 1' to configure it. A window will open so destination IP can be modified. At centre of the new window the following texts will appear:

- Description ➔ Description name of destination IP address. It will be the very beltpack to receive the data packages. It can be freely chosen by the user.
- Send to ➔ It is destination IP address. Separate each digit group with '.' (dots).
- UDP Port ➔ It is port number for establishing communications between intercom equipments. Use '8087' as standard (any other available port can be used though).

NB: *This port must be declared with TCP/IP gateways of the network so they can let information go.*

Once descriptor, destination IP address and port have been entered, press 'Add'. This way network module of base station will send audio to its destination network module (wireless beltpack).

Remove any other destination IP address as only one is valid.

See below how other parameters must be configured:

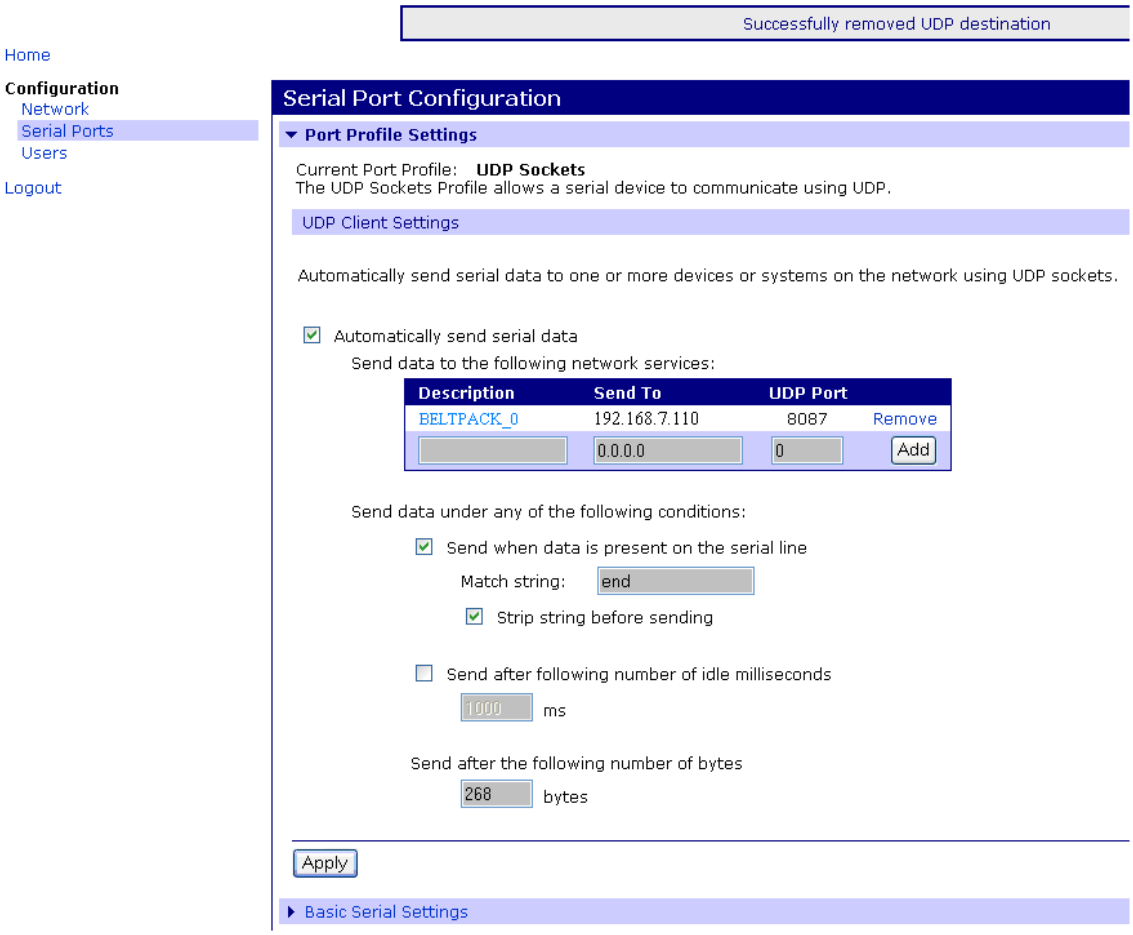


Figure 3.42 Assigning destination IP address

3.2 BELTPACK

It is a wireless beltpack that connects to the fixed network module via WIFI. Assignment is done easily with a computer by configuring local and remote IP addresses through the web browser server.

One side of the beltpack is provided with an ON/OFF switcher, power led, volume potentiometer for headphones and integrated microphone mute key. There are also leds for monitoring coverage status and mute audio.

Figure 3.43 Wireless beltpack

At the other side user will find connector for battery charging with its status led, headset connector and 'SMA Reverse' connector for the antenna. There are also two leds (L1, L2) for monitoring status of connection to point of access.

Antenna is passive and range will depend on distance to point of access. In open spaces, range is 100+ meters. Distance can be increased with bigger antennas or with WIFI repeaters or amplifiers…

See below functioning of orange led 'ACT':

- *Link status* ➔ Constant flickering means no connection with base station.
- *Coverage level* ➔ When beltpack is working, and near the coverage limit, flashings indicate that beltpack has loosed some audio frames.
- *Mute key* ➔ When ON, microphone audio is muted.
- *Audio level limit* ➔ Headphones volume cannot be decreased or increased more than current so led flashes.

Beltpack will take 20-25 seconds to be fully operative from switching on. See L1 and L2 leds for process monitoring:

- L1 green led ➔ Constant flickering indicates proper TX/RX connection between beltpack and point of access.

- L2 orange led ➔ When ON, proper connection between beltpack and point of access has been established. When flickering, beltpack cannot connect to any point of access (non operative beltpack).

NB: *If L2 flickers, check network parameters of the beltpack and point of access and also that beltpack is in range.*

Local audio level is handled by the potentiometer and integrated mute key. A keystroke mutes microphone and makes ACT led on. Another one releases the mute.

When max and min headphones audio levels are reached with multiturn potentiometer, user will hear a tone and see a flashing of ACT led.

Audio input and output is done by a MiniXLR-6P connector. It is aimed at electrect microphones and headset output.

It is provided with a lithium battery that supports up to 6 hours of continuous functioning. When 'POW' led flickers in red color, the beltpack needs to be connected to the external charger. So, a little sound acoustic is incorporated in the listened audio.

NB: *Beltpack will be operative even connected to external charger.*

Once connected, 'CHARGE' red led will be ON. It will take 5-6 hours for full recharge. Led brightness will decrease while recharging. When OFF, charge has been properly done. It is advised then to disconnect the external charger.

3.2.1 WIFI PARAMETERS CONFIGURATION

As we saw before with fixed network modules of the base station, univocous IP addresses must be assigned to each beltpack. Each one has two IP identifiers for that network: a local one and a remote one (the destination of data packages being sent).

To configure local IP address user can either do it as described at previous chapter regarding base station or do it via web server should he know current IP address.

Should user need to modify destination IP, use the web server via browser (for example, Explorer) and enter IP address of the beltpack to have access to the configuration.

A window similar to the base station seen before will appear. Enter user and password: '**user'**.

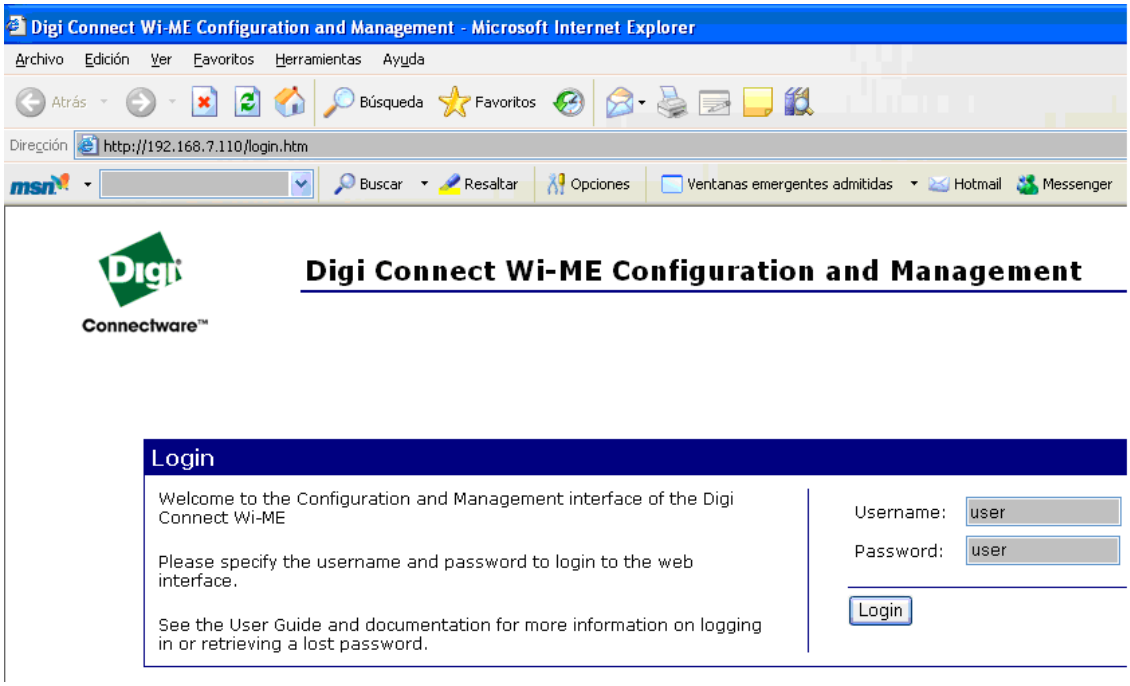

Digi Connect Wi-ME Configuration and Management - Microsoft Internet Explorer
Archivo Edición Ver Favoritos Herramientas Ayuda
Atrás Búsqueda Favoritos
Dirección http://192.168.7.110/login.htm
Buscar Resaltar Opciones Ventanas emergentes admitidas Hotmail Messenger
Digi
Connectware™
Digi Connect Wi-ME Configuration and Management
Login
Welcome to the Configuration and Management interface of the Digi Connect Wi-ME
Please specify the username and password to login to the web interface.
See the User Guide and documentation for more information on logging in or retrieving a lost password.
Username: user
Password: user
Login

Figure 3.44 Access to the web server of WIFI module of the beltpack

Once user & password have been entered, press 'Login' and available options will appear:

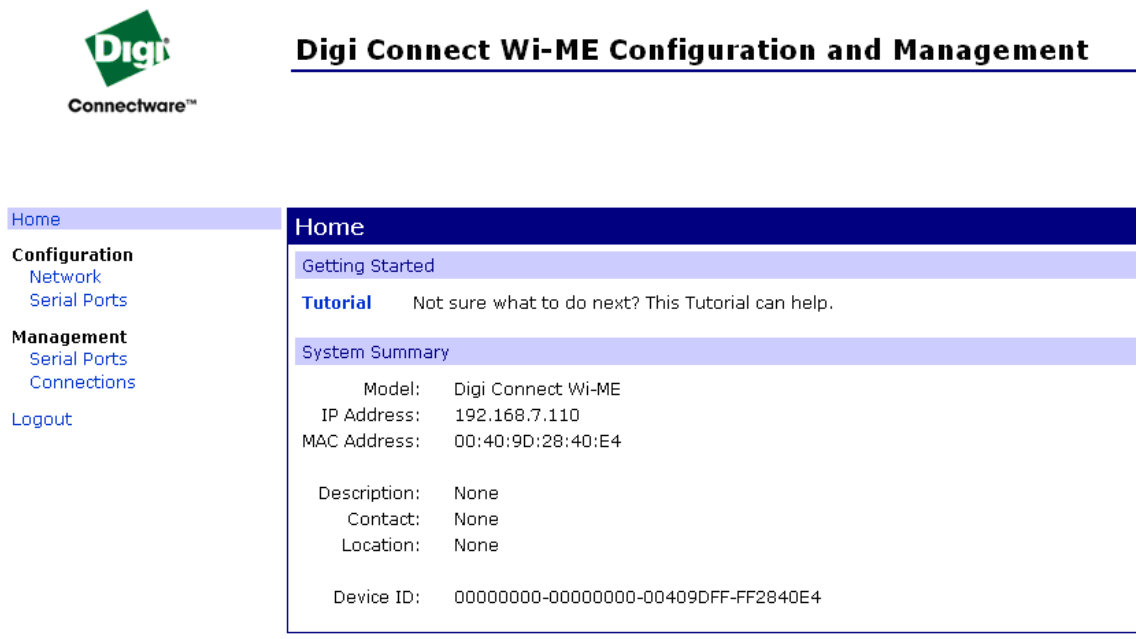


Figure 3.45 Configuring beltpack network module

At the right window, beltpack info will appear: IP and MAC addresses. The second one cannot be changed. Click on “Network” to modify IP.

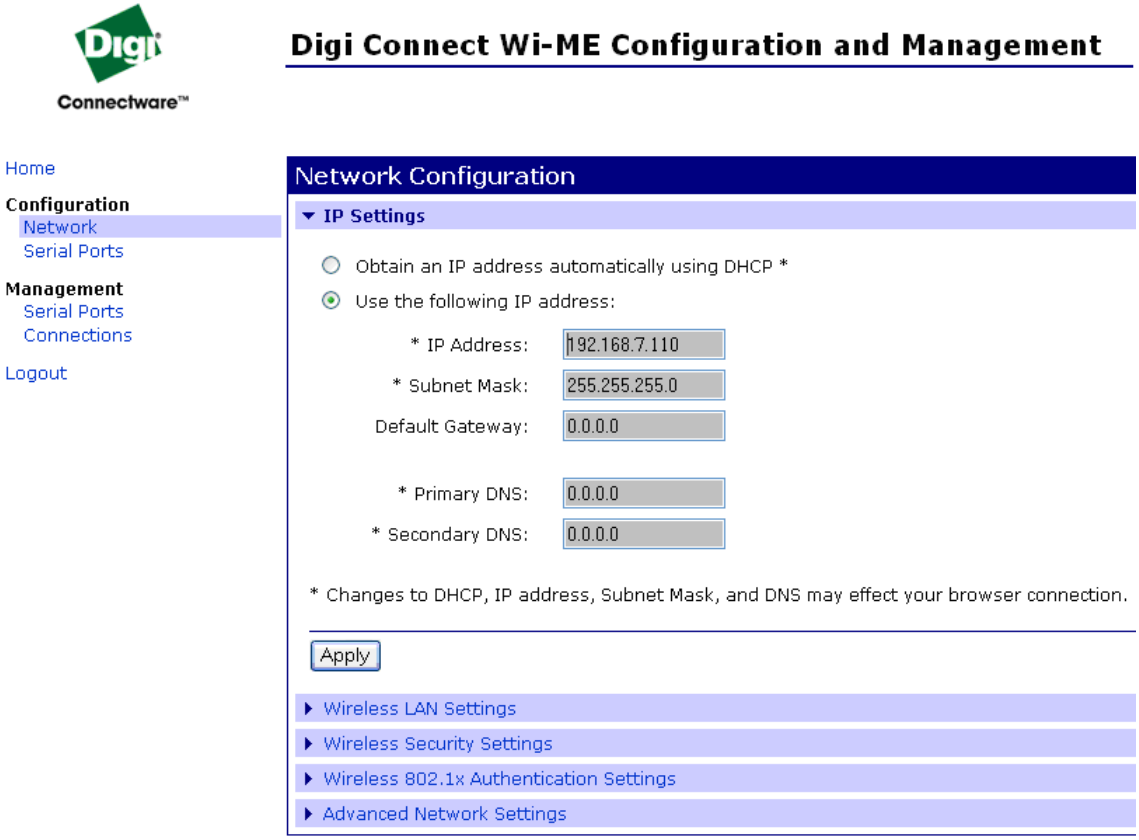


Figure 3.46 Configuring IP of local network module of beltpack

At the right side, user can put new IP and its mask. Then press ‘Apply’.

An important parameter to configure at beltpacks and point of access is the name of the WIFI network, that is, the ***SSID***. For wireless beltpacks modules, enter it at ‘Wireless LAN Settings’ option. This name must be the same for the whole system.

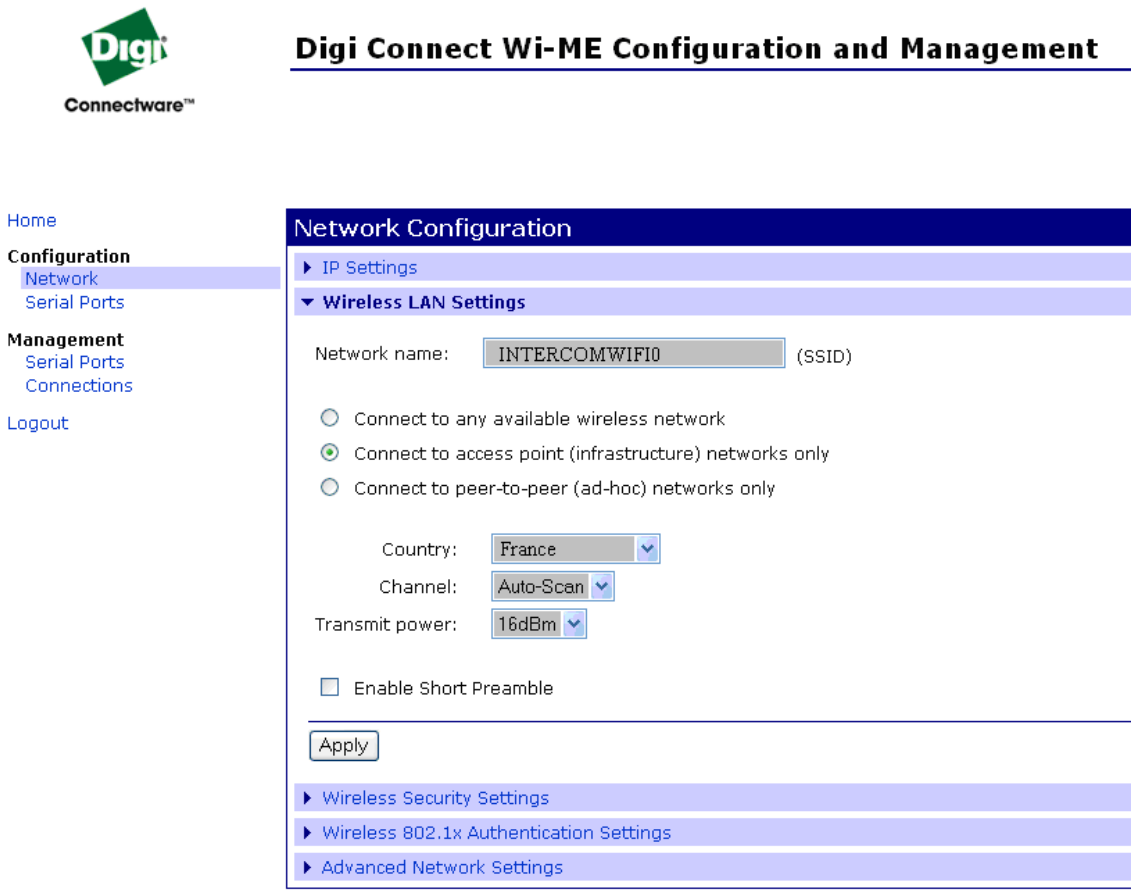


Figure 3.47 Configuring network name

Other wifi parameters that can be configured are: country, channel, TX power. It is advised not to modify them, leave them as they come.

Rest of options are security ones for communication with point of access. A user-chosen cipher code can be entered. It must be the same to the one used at the point of access. Contact tech support for more info.

For modifying destination IP address click on 'Serial Ports' option. A new window will appear with info on an UDP connection via port 1 as seen below:

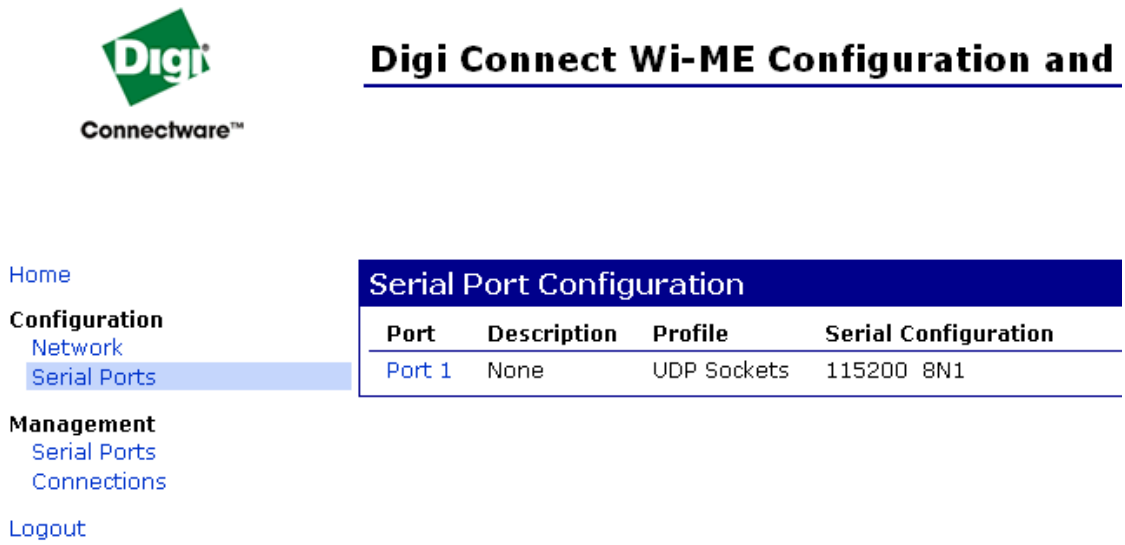


Figure 3.48 Information of port connection

Click on 'Port 1' to modify destination IP (as done with network modules of base station). Window will display the following options:

- Description ➔ Name for destination IP. The name of the network module of the base station that will receive the audio packages. Freely chosen by user.

- Send to ➔ Destination IP address. Separate each digit group by dots '.'

- UDP Port ➔ It is the port number for establishing communications with intercom equipments. Set '8087' as default. Anyhow any other available port can be used.

Once entered, press 'Add' so beltpack will send audio packages to that destination IP address. This must match a network module of the base station.

Rest of options must be left as they are below:

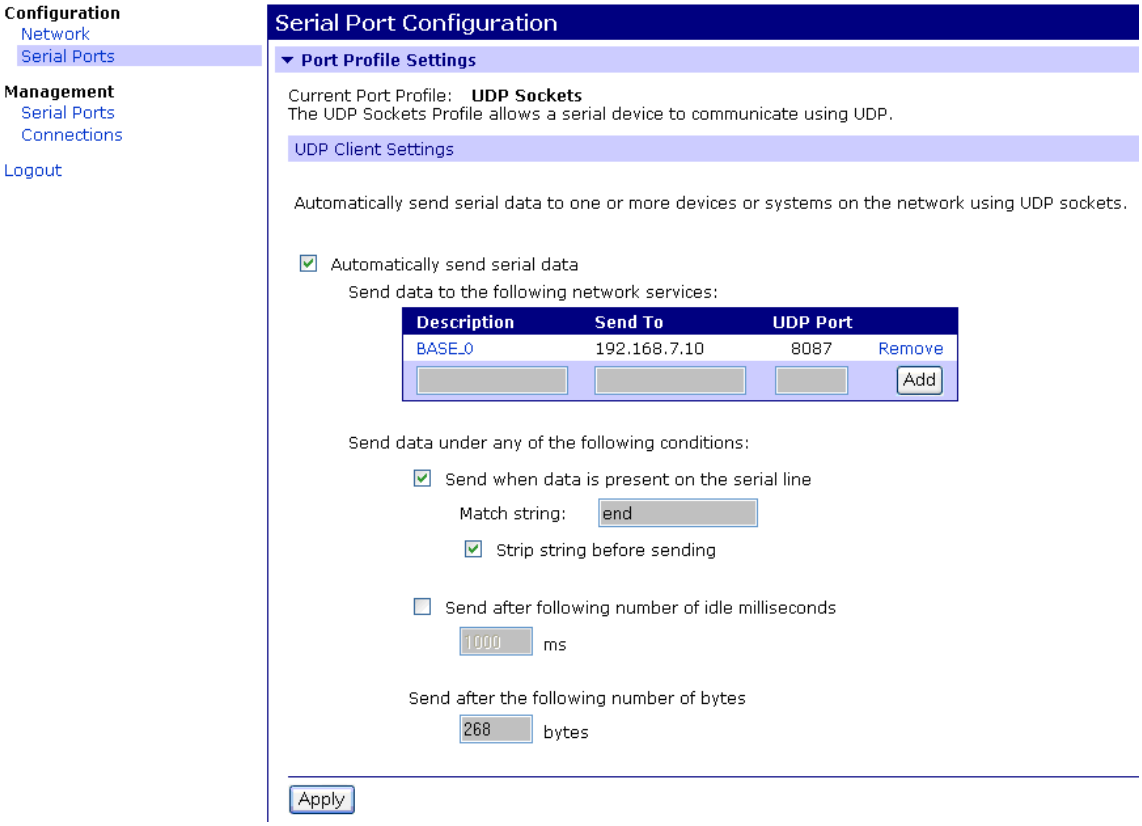


Figure 3.49 Assigning destination IP

NB: *Assign only one destination IP address.*

4 APPENDIX

4.1 OPTIONS AND ACCESSORIES

Apart from base station and wireless beltpack, system also consists of:

- TW7100X01

License for activating a network module of the base station. User needs one per beltpack.

- PS2400X11

External power supply for base station with European plug. Switched isolated AC/DC with 110~220v, 50~60Hz input and multivoltage output (max power 45w, +5v/5A, +12v/3A, -12v/0.5A).

One end has 220v AC input while the other has cable to base station with DIN connector. See Figure below for pinout data of male DIN connector of base station:

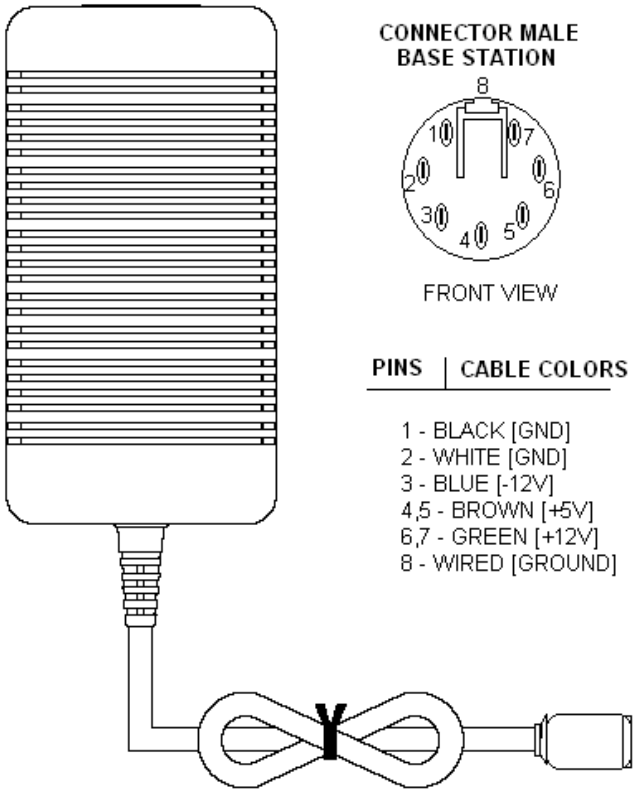


Figure 4.1 External power supply for base station

Redundant power supply is advised.

- PS1300X11

External power supply for beltpack recharging with European plug. Switched isolated with AC/DC input at 110~220v, 50~60Hz and 15v output. Power 36w.

Figure 4.2 Recharging power supply for beltpack

Jack connector is at beltpack end, where its central pin has active voltage and external metallic surface is ground.

This power supply is supplied with beltpack by default.

- MC7000X03

It is lightweight one-ear headset for base station and beltpack for sending and receiving audio. It is supplied with beltpack by default. With base station, it is an optional accessory.

Figure 4.3 Headset for TW7100

Type of Connector is female 6-pin Mini-XLR. Length of cable is 1.5m. See pinout below:

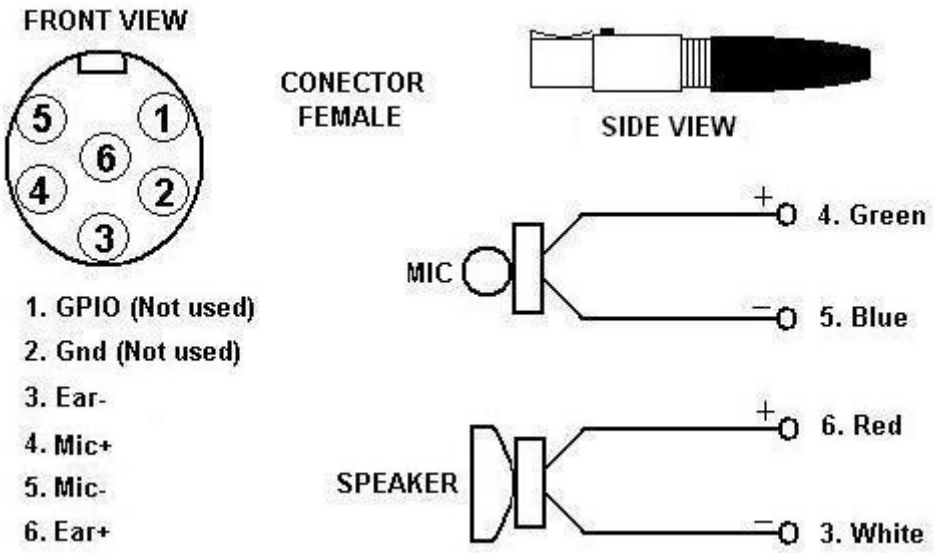


Figure 4.4 Headset connector

See below technical specs of microphone and speaker:

MICROPHONE	
TYPE	ELECTRET
DIRECTIONALITY	DIFERENTIAL, NOISE CANCEL
POWER SUPPLY	3.3V
CURRENT DRAIN	Icc = 400 uA max
SENSIVITY @ 1Khz (0dB=1V/µbar)	Vs = -62 dB (±3dB)
FREQUENCY BANDWIDTH	300-3400 Hz
SPEAKER	
TYPE	ELECTRO-DYNAMIC
IMPEDANCE @ 1Khz	300 Ω
SENSITIVITY @ 1Khz / 1mW	106 dB SPL (±3dB)
FREQUENCY BANDWIDTH	300-3400 Hz
WEIGHT (with cable)	40 g

Chart 4.1 Tech specs of headset

- MC7000X07

It is an earpiece with transparent tube for presenters and journalists. Audio reception and transmission with PTT. Type of connector is female 6-pin Mini-XLR 6. Length of cable is 1.5m. Not provided by default. Optional accessory.

MICROPHONE	
TYPE	ELECTRET, WITH PTT
DIRECTIONALITY	DIFERENTIAL, NOISE CANCEL
POWER SUPPLY	3.3V
SPEAKER	
TYPE	ACUSTIC TRANSDUCER
WEIGHT (with cable)	50 g

Chart 4.2 Earpiece specs

Figure 4.5 Earpiece

- TW7100X02

It is the access point that provides WIFI coverage to beltpacks. It complies with IEEE.802.11b/g standard. It has remote power supply over Ethernet (POE). Its internal flat antenna has a 16dBi gain.

As antenna is internal and power is remotely provided (via two wires of data cable connected to Ethernet - POE), it is ideal for its location in studios, closed venues, etc.

Figure 4.6 WIFI Access Point

Its mechanical design provides humidity isolation, allows an indoors or outdoors placement and comes with a locking kit for several positions.

For having access to its WIFI configuration, enter its IP address in a web browser. User is '**admin**' while password is '**user**'.

- Technical specifications
  - **Operative modes:** AP, AP Client, Repeater, Bridge.
  - **Standard:** IEEE 802.3, 802.11b and IEEE 802.11g or 802.11b
  - **Ethernet LAN:** 10/100Base-T Ethernet.
  - **Chipset:** Broadcom
  - **Frecuency:** 2.400 - 2.4835 GHz.
  - **Num. of Channels:** 13
  - **Transmission rates:**
    802.11b: 1, 2, 5.5, 11Mbps
    802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps.
  - **Modulation:**
    802.11b: 1M: DBPSK, 2M: DQPSK, 5.5M, 11M: CCK
    801.11g: OFDM
  - **Spreading:** DSSS (Direct Sequence Spread Spectrum).
  - **Power:** 15 dBm, plus antenna gain
  - **Antenna:** Integrated, flat 18 dbi.
  - **Sensibility:** min. -80 dBm at 11 Mbps, min. -65dBm at 54 Mbps.
  - **Protocols:** TCP/IP, IPX/SPX, NetBEUI.
  - **Support:** DHCP Client, HTTP Server; Roaming in the same sub-net, Default Settings Restore, Backup / Restore Setting.
  - **Firmware:** Basic Rate Setting, Regulation Domain Setting, DMZ, Virtual Server,IP filtering,VPN pass-through (Support PPTP, L2TP and IPsec).
  - **Security:** 64bit/128bit WEP, ACL (MAC address filter), WPA.
  - **Temperature:** -10°C - 50°C (operative).
  - **Humidity:** max. 95% (without condesation).

Chart 4.3 Point of access characteristics

- TW7100X03

It is a WIFI access point that complies with IEE.802.11b/g standard. It is powered remotely (power over Ethernet) and is provided with N-type external antenna (not included).

Figure 4.7 WIFI Access Point (antenna not included)

- TW7100X04

It is a WIFI access point that complies with IEE.802.11b/g standard. It is powered remotely (power over Ethernet) and external omnidirectional antenna.

It is ideal for outdoors as its mechanics allows multiple fittings to vertical pole-type antennas.

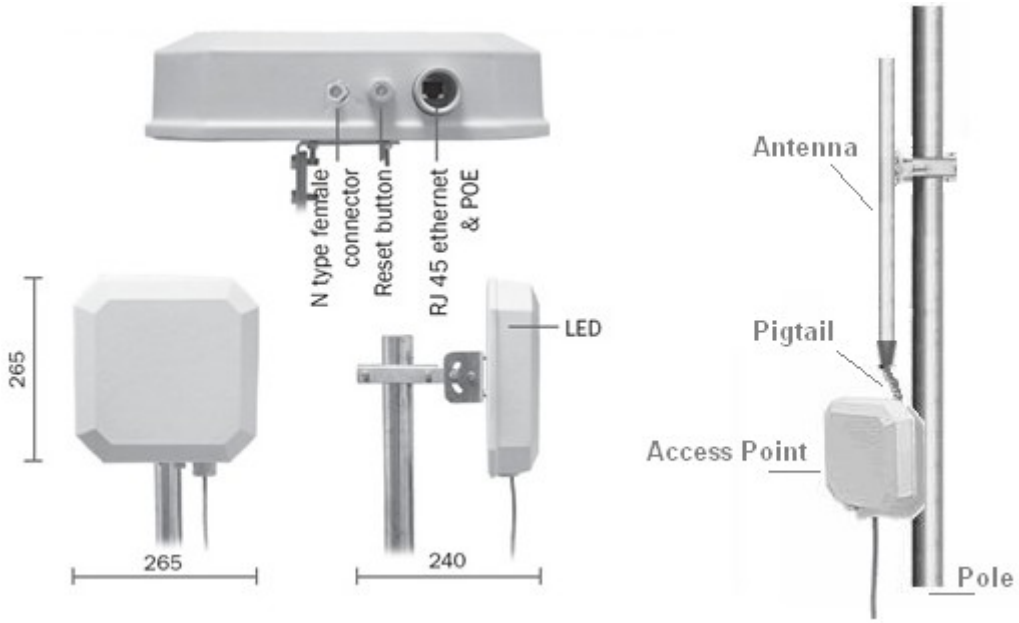


Figure 4.8 WIFI Access Point with omnidirectional antenna

- Technical specifications
  - **Operative modes:** AP, AP Client, Repeater, Bridge.
  - **Standard:** IEEE 802.3, 802.11b and IEEE 802.11g or 802.11b
  - **Ethernet LAN:** 10/100Base-T Ethernet.
  - **Chipset:** Broadcom
  - **Connector:** N-type female
  - **Frecuency:** 2.400 - 2.4835 GHz.
  - **Num. of Channels:** 13
  - **Transmission rates:**
    802.11b: 1, 2, 5.5, 11Mbps
    802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps.
  - **Modulation:**
    802.11b: 1M: DBPSK, 2M: DQPSK, 5.5M, 11M: CCK
    801.11g: OFDM
  - **Spreading:** DSSS (Direct Sequence Spread Spectrum).
  - **Power:** 15 dBm, plus antenna gain
  - **Sensibility:** min. -80 dBm at 11 Mbps, min. -65dBm at 54 Mbps.
  - **Protocols:** TCP/IP, IPX/SPX, NetBEUI.
  - **Support:** DHCP Client, HTTP Server; Roaming in the same sub-net, Default Settings Restore, Backup / Restore Setting.
  - **Firmware:** Basic Rate Setting, Regulation Domain Setting, DMZ, Virtual Server,IP filtering,VPN pass-through (Support PPTP, L2TP and IPsec).
  - **Security:** 64bit/128bit WEP, ACL (MAC address filter), WPA.
  - **Temperature:** -10°C - 50°C (operative).
  - **Humidity:** max. 95% (without condesation).

Chart 4.4 Access Point characteristics

It is an omnidirectional antenna for pole with a +9dBi gain and vertical 23º wide angle. Connection cable between antenna and access point is not provided (must be a 50Ω coaxial cable type RG58)It is an omnidirectional antenna for pole with a +9dBi gain and vertical 23º wide angle. Connection cable between antenna and access point is not provided (must be a 50Ω coaxial cable type RG58)

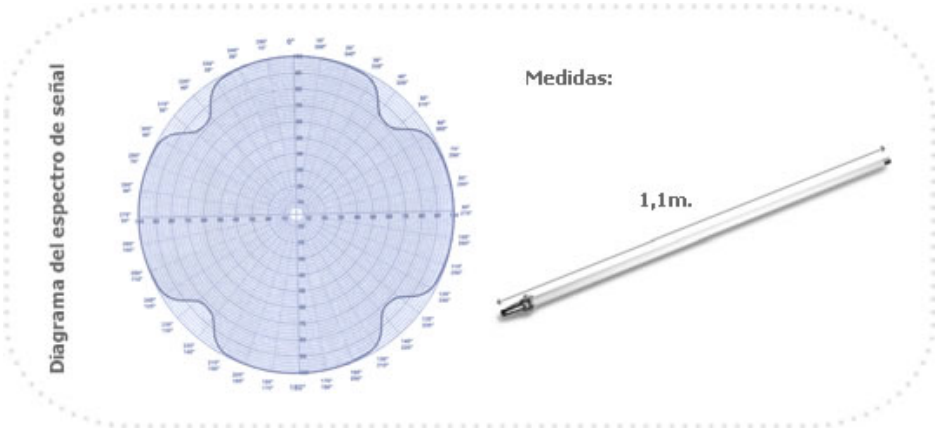


Figure 4.9 Pole antenna

See specifications below:

Technical specifications:
• **Frequency Range:** 2400-2490
• **360º Gain:** 9dB
• **Polarization:** Vertical
• **Horizontal Signal:** 360º
• **Impedance: 50 Ohm**
• **Connector:** female N-type
• **Length**: 1.1 m

Chart 4.5 External antenna features

- TW7100X05

It is a WIFI access point that complies with IEE.802.11b/g standard. It is powered remotely (power over Ethernet) and external omnidirectional antenna.

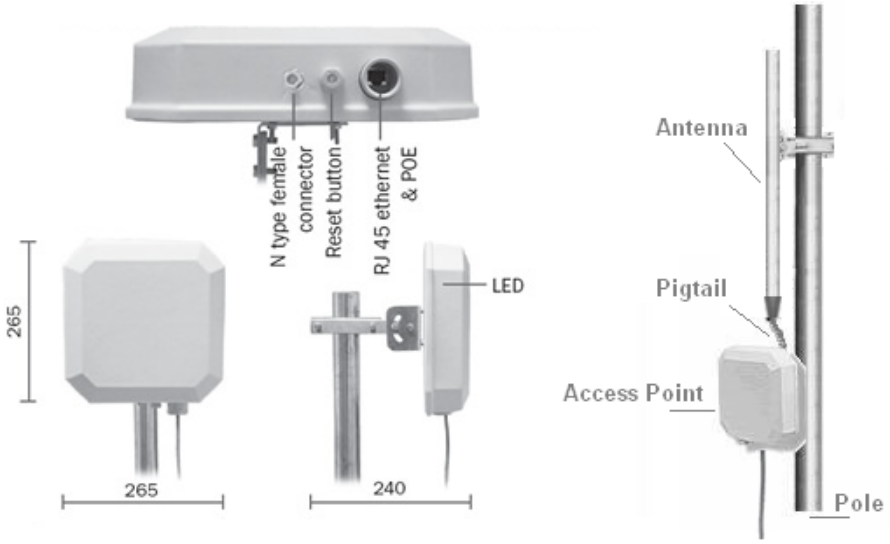


Figure 4.10 WIFI Access Point with omnidirectional antenna

- Technical specifications
  - **Operative modes:** AP, AP Client, Repeater, Bridge.
  - **Standard:** IEEE 802.3, 802.11b and IEEE 802.11g or 802.11b
  - **Ethernet LAN:** 10/100Base-T Ethernet.
  - **Chipset:** Broadcom
  - **Connector:** N-type female
  - **Frecuency:** 2.400 - 2.4835 GHz.
  - **Num. of Channels:** 13
  - **Transmission rates:**
    802.11b: 1, 2, 5.5, 11Mbps
    802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps.
  - **Modulation:**
    802.11b: 1M: DBPSK, 2M: DQPSK, 5.5M, 11M: CCK
    801.11g: OFDM
  - **Spreading:** DSSS (Direct Sequence Spread Spectrum).
  - **Power:** 15 dBm, plus antenna gain
  - **Sensibility:** min. -80 dBm at 11 Mbps, min. -65dBm at 54 Mbps.
  - **Protocols:** TCP/IP, IPX/SPX, NetBEUI.
  - **Support:** DHCP Client, HTTP Server; Roaming in the same sub-net, Default Settings Restore, Backup / Restore Setting.
  - **Firmware:** Basic Rate Setting, Regulation Domain Setting, DMZ, Virtual Server,IP filtering,VPN pass-through (Support PPTP, L2TP and IPsec).
  - **Security:** 64bit/128bit WEP, ACL (MAC address filter), WPA.
  - **Temperature:** -10°C - 50°C (operative).
  - **Humidity:** max. 95% (without condesation).

Chart 4.6 Access Point characteristics

Included antenna is omnidirectional for pole with a +15dBi gain and vertical 23º wide angle.

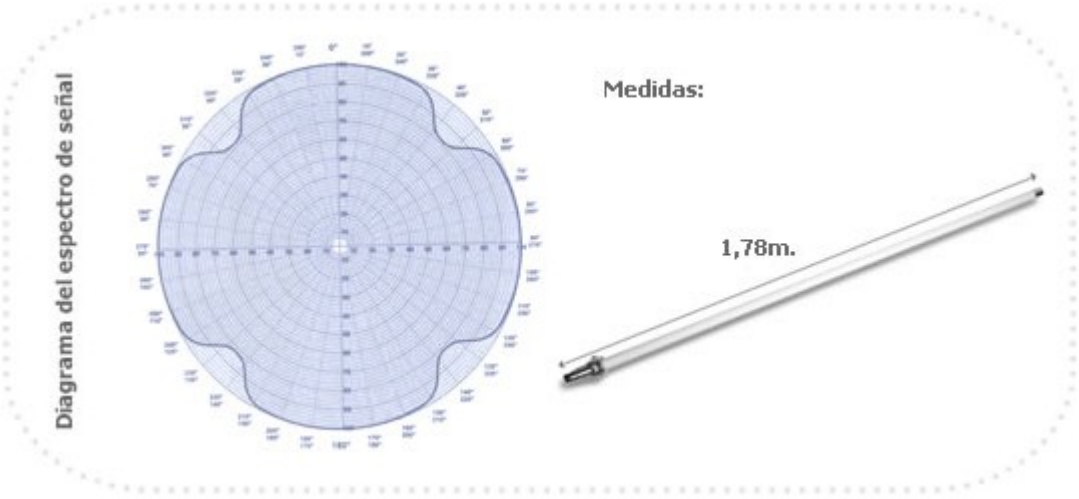


Figure 4.11 Pole antenna

See specifications below:

Technical specifications:

- **Frequency Range:** 2400-2490
- **360º Gain:** 15dB
- **Polarization:** Vertical
- **Horizontal Signal:** 360º
- **Impedance: 50 Ohm**
- **Connector:** female N-type
- **Length**: 1.78 m

Chart 4.7 External antenna features

An N-type antenna connector is located in its below part to be connected to the point of access with a 50Ω coaxial cable (RG58 type).

- TW7100X06

It is an Ethernet switch for routing and controlling IP data packages traffic over the intercom Ethernet network. All network ports of base station as well as points of access need to be connected to it.

Figure 4.12 Switch Ethernet

Eight network ports are located in its rear side with RJ45 connectors. In its rear panel user will find leds for monitoring port status. See below its main features:

- Technical specifications
  - **Standards:** IEEE802.3, IEEE802.3x and IEEE802.3u
  - **Ports:** 8 puertos RJ45 STP
  - **Transmission:** Auto negotiation NWAY (half/full duplex, 10/100Mbps)
  - **Uplink:** Independent port
  - **Memory:** 1 Megabytes
  - **Temperature:** 0~50º C
  - **Power:** 12-20VDC, External power supply
  - **MAC Addresses:** 1000 MAC addresses table
  - **Filtering (Max):** 148,000 frames/sec
  - **Forwarding (Max):** 148,000 frames/sec
  - **LEDs:** Power, Buffer error, Link / Activity, Full/Half Duplex, Speed
  - **Humidity:** 10%~90% (without condensation)
  - **Dimensions:** 174 x 106 x 31 mm
  - **Assembly:** Desktop

Chart 4.8 Switch features

Each led is assigned to an Ethernet port. If Ethernet link is active, led will be on. It will be flickering on data transmission.

4.2 GUARANTEE

KROMA TELECOM S.A. guarantees that the equipment (at purchasing time) complies with the purchase order's specification and that is in faultless conditions.

The warranty period is one year from date of purchase for equipment and accessories. The warranty covers repairing costs, labour and updates. This warranty does not cover freight costs, final installation or components substitution when the components' failure is due to normal use wear-out.

This warranty does not cover any fault or damage provoked by undue use; neither covers unauthorised use by non KROMA's technical staff.

In order to facilitate the procedure, contact your dealer before sending any failed equipment to the technical team.

For maintenance or support contact our technical team at BROAD SERVICE (telephone or email). For more detailed information check our web www.kromatelecom.es.

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